Including ELECTRONIC INDUSTRIES for Defense

See Page 1

TELE-TECH

TELEVISION • TELECOMMUNICATIONS • RADIO

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JUN 2 6 1951
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Gen. M. B. Ridgway, (left) Chief Signal Officer, USA, and Col. E. P. Hammond, Signal Officer, FEC, review troops in Tokyo.

Color-TV Developments • Shock Testing of Electronic Equipment • What's the Score • Transducers • New Vacuum Tube Materials

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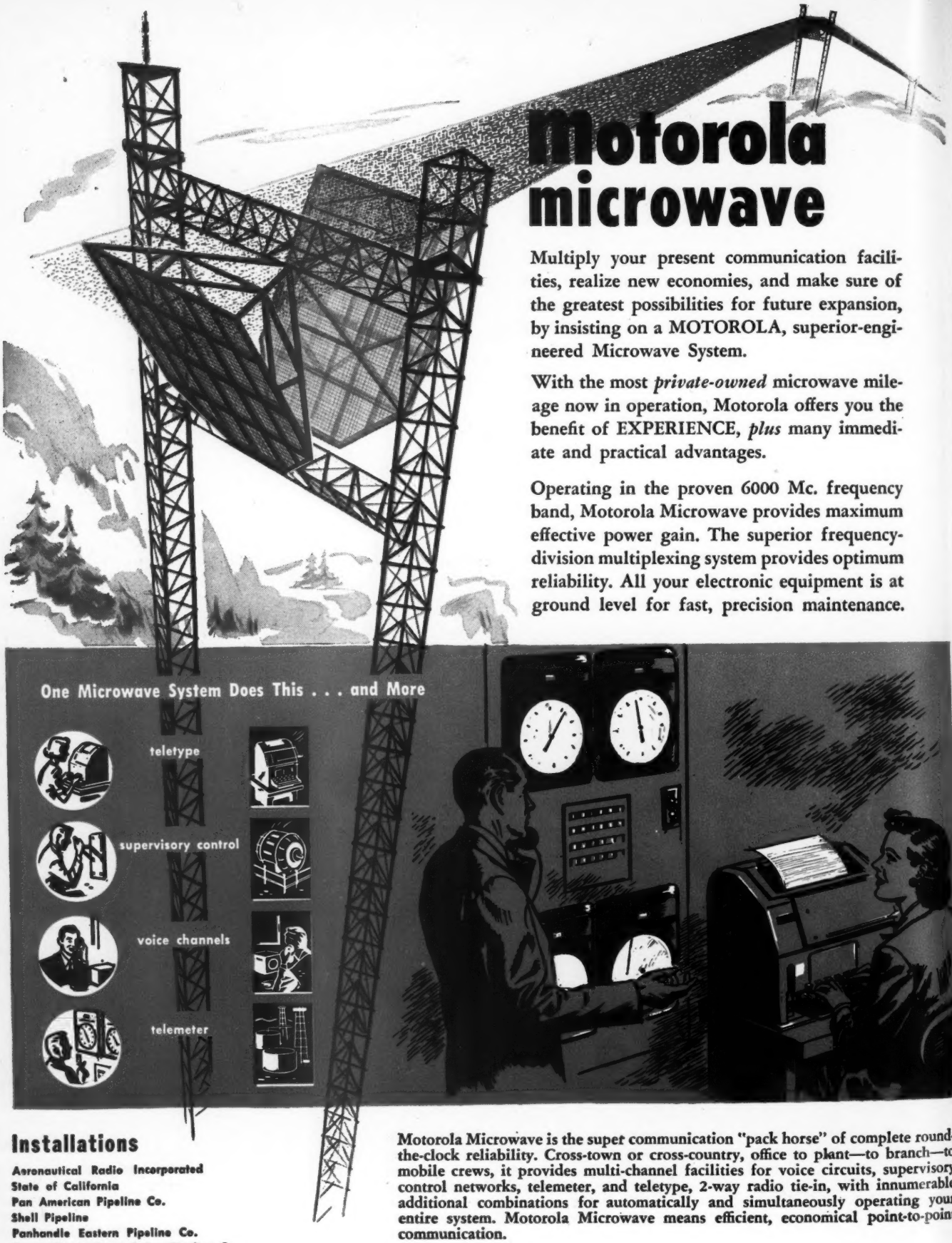

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JULY, 1951

COVER: TOKYO PARADE FOR General Back, new Chief Signal Officer. Major General George I. Back, former Signal Officer, U. S. Army (left), with Colonel E. F. Hammond, newly-appointed Signal Officer, FEC, photographed in May, 1951, during a farewell "retreat" parade held in honor of General Back at the 71st Signal Service Battalion Area, Tokyo.

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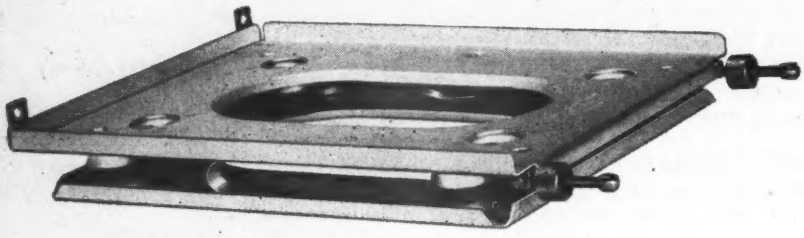

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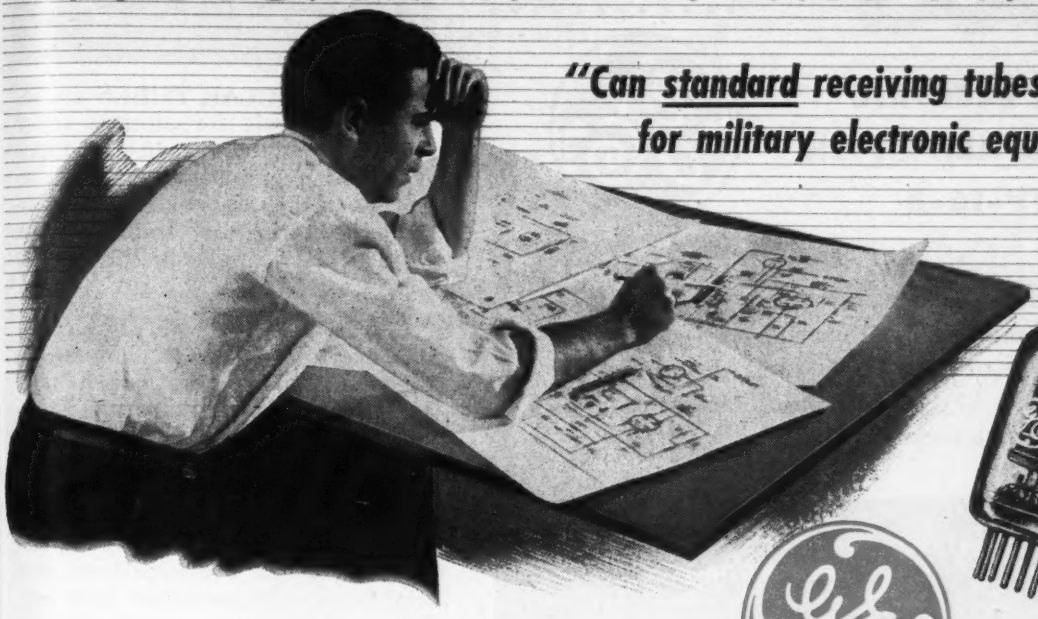
TV DESIGNER'S DEFENSE PROBLEM

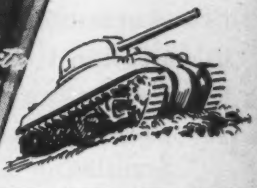
"Can standard receiving tubes be specified for military electronic equipment?"



GL-5654

GL-5670

GL-5686



In some cases, no. But all General Electric 5-STAR TUBES are on the Armed Services' Preferred List. They're the last word in dependability! *Every 5-Star Tube* gets 48 hours' service at the factory under Class A conditions. Frequent life tests also are made. During manufacture, 5-Star Tube parts are inspected individually prior to careful and precise hand-assembly.

That new military circuit you've been asked to design, will do its task better—*far more reliably*—with G-E 5-Star Tubes to help assure steady performance under fire. You have nine types to choose from, covering a wide range of applications. Other types will be added later. They will further extend G-E 5-Star usefulness.

Aviation—for which 5-Star Tubes originally were developed—pays enthusiastic tribute to the job these special G-E tubes have done in making airborne travel safer. Now General Electric offers the same fine tube performance to *you*, so that equipment you're designing may approach absolute standards of reliability— may meet stiff military performance requirements. Fill out, clip, and mail the coupon below! *Electronics Department, General Electric Company, Schenectady 5, New York.*

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GL-5670	H-f twin triode
GL-5686	Beam power amplifier
GL-5725	Dual-control sharp-cutoff r-f pentode
GL-5726	Twin diode
GL-5749	Remote-cutoff r-f pentode
GL-5750	Pentagrid converter
GL-5751	High-mu twin triode
GL-5814	Medium-mu twin triode

General Electric Company—Section 4,
Building 267—Schenectady 5, N.Y.

☐ Please mail me the facts about G-E 5-Star Tubes—their performance characteristics; how they are manufactured, how tested.

☐ Please have a tube engineer call on me, to discuss G-E 5-Star Tubes and their applications in circuits I am designing.

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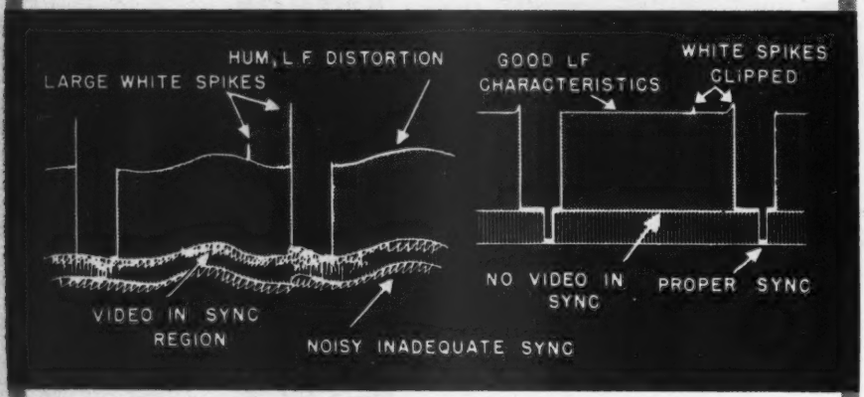
GENERAL ELECTRIC

181-K3

Facts— YOU SHOULD KNOW ABOUT

GENERAL ELECTRIC STABILIZING AMPLIFIER TYPE TV-16-B

Input and Output — No other stabilizing amplifier gives you a choice of matching or bridging input with an input gain for both. This unit provides *two* standard RTMA outputs. One of these can be used for monitoring—with as much as 37 db of isolation between monitor output and picture output.



Vertical Wave Form — Output level control can be adjusted while maintaining critical circuits at a constant signal level. This effectively increases the range of input variation over which the amplifier will maintain stability.

White Clipper—A unique General Electric feature that guards against overloads due to "whites". It may also be used as a guard against buzz in intercarrier type receivers.

Automatic Correction of the sync and blanking portion of the television signal, adjustable sync percentage, and improved LF characteristics are the important benefits available with G.E.'s new Stabilizing Amplifier.

FREE— Handy leatherette folder containing specification bulletins of all General Electric TV Station equipment will be forwarded on request to television station managers and engineers. Write: *General Electric Company, Section 4871, Electronics Park, Syracuse, New York.*

GENERAL ELECTRIC

TELE-TIPS

RECTANGULAR TUBES are becoming the rule for aircraft radar indicators and their use in other types of military equipment is on the increase. In the case of aircraft equipment the rectangular design permits savings in two vital design factors, weight and size.

COCKPIT TO PENTAGON— Efficiency of communication links between command headquarters and Air Force bomber groups was highlighted recently by Brig. Gen. W. G. Smith, commanding general of the Airway and Air Communications Service. Thanks to the vast facilities of the AACS, he said that if the situation demands, Pentagon brass can establish two-way contact with any U.S. bomber group anywhere in the world—even when airborne.

FACSIMILE has proven itself to be an important method of military communication. During recent equipment tests in the arctic, atmospheric conditions frequently made transmission of intelligence by radio unreliable. It was found that by drawing large letters or numerals on the paper being fed into the facsimile-radio transmitter, that the outline of the numeral or letter at the receiving end, although distorted by the interference, would still be discernible.

IMPROVED MINE DETECTORS developed by the Corps of Engineers will operate on land and under water, announces Dr. W. R. G. Baker, G-E vice-president, whose company has received a $2,000,000 contract for the devices, which resemble vacuum cleaners.

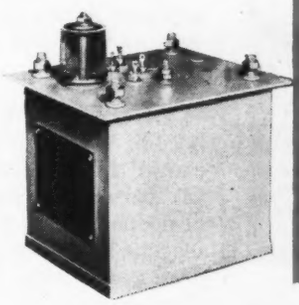
The new detectors will locate buried mines in any kind of soil. Older types are useless where magnetite, or black earth, is prevalent. The new detector, also able to operate under water, should prove more effective in clearing beach areas. It has been a practice to lay land mines in shallow water near beaches to intercept landing craft and troops. Presence of a buried mine is indicated by a combination of visual and aural means. The visual meter indicates the presence of a mine and simultaneously, its presence is further revealed by a sound in the headset worn by the operator.

(*Continued on page* 16)

a complete line of hermetically sealed oil-filled HIGH-VOLTAGE COMPONENTS

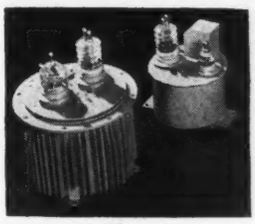
Rectifiers

Small, lightweight a-c to d-c power supply units for use with cathode-ray tubes, television camera tubes and radar indicator scopes, electron microscopes, and similar jobs. Typical outputs are 7, 9 and 13 kv. Low regulation—the 7-kv unit illustrated does not exceed 3.5% regulation per 0.1 milliampere load, holds ripple on output voltage to less than 1%. Size, only 6" x 6" x 7"; weight 8 lb.



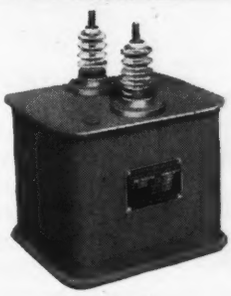
Pulse Transformers

Pulse transformers for use with either hard-tube or line-type modulators. Available in voltage ratings of 10 kv or above. These units are ideal for radar applications, stepping up or down, impedance matching, phase reversing and plate-current measurements. Also suitable for nuclear physics research work, television and numerous special applications in and out of the communications fields.



Resonant Reactors

Resonant-charging reactors, accurately designed and constructed for radar service. Usually required in ratings of 40 kv and below, 1 ampere and below and 300 henries and below. Higher ratings are being built, and can be considered. When required, small- and medium-size designs can be provided with 3 to 1 range of inductance adjustment.



Filament Transformers

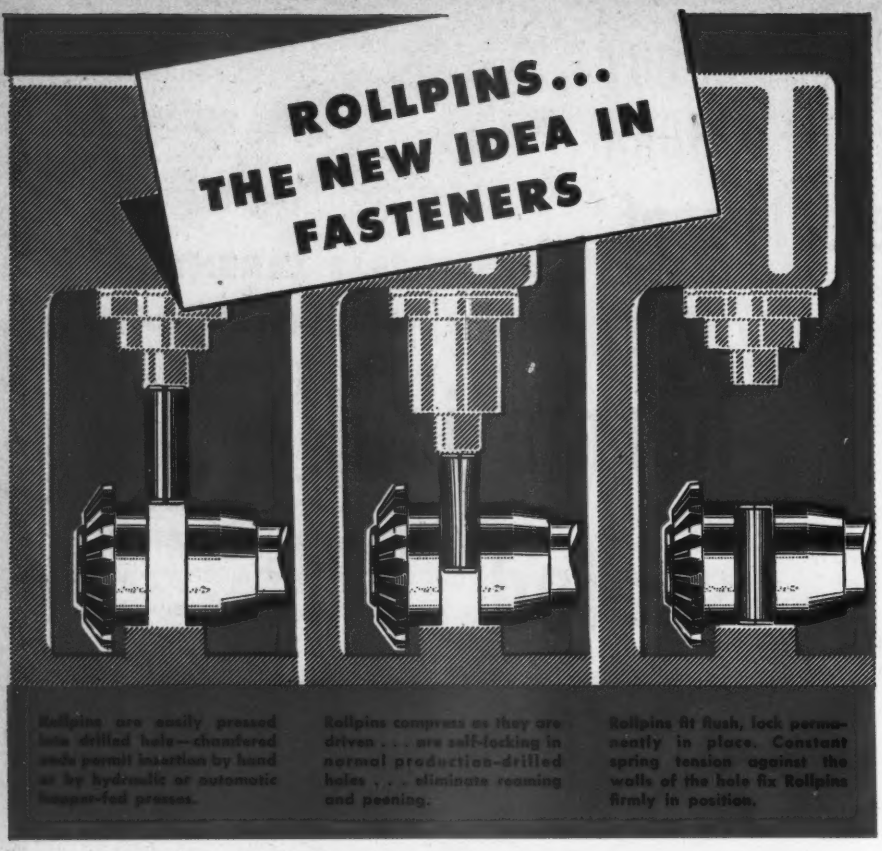
Filament transformers available with or without tube socket mounted integral with the high-voltage terminal. Low capacitance. Ratings to match any tubes; insulated to practically any required level.

Illustrated here are typical high-voltage components manufactured by General Electric. They can be built to meet Armed Services requirements. All are oil-filled and hermetically sealed—with excellent ability to withstand mechanical shocks and to operate continuously for long periods in widely varying temperatures. Apparatus Dept., General Electric Company, Schenectady, N. Y.

Your inquiries will receive prompt attention. Since these components are usually tailored to individual jobs, please include with your inquiry, functional requirements and any physical limitations. *Write to Apparatus Dept., 42-328A, General Electric Co., Pittsfield, Mass.*

GENERAL ELECTRIC

401-63



Rollpins are easily pressed into drilled holes—chamfered ends permit insertion by hand or by hydraulic or automatic hopper-fed presses.

Rollpins compress as they are driven . . . are self-locking in normal production-drilled holes . . . eliminate reaming and peening.

Rollpins fit flush, lock permanently in place. Constant spring tension against the walls of the hole fix Rollpins firmly in position.

How to cut pinning costs with Rollpin self-locking fasteners

Investigate now the real production savings on every type of job involving pinning. Rollpin self-locking fasteners are ready to help you do away with expensive reaming, peening, machining and threading operations by replacing taper pins, grooved pins, rivets and set-screws.

Quickly inserted into standard drilled holes, Rollpins are there to stay—vibration-proof until removed with a pin punch . . . and Rollpins can be *re-inserted* with a hammer! A neat, clean, self-locking assembly is provided; and Rollpins exceed the shear strength of a cold rolled pin of equal diameter.

Slashing assembly time, inspiring new product designs, simplifying old fastening procedures, Rollpins are now helping cut manufacturing costs as steel fastening pins holding pulleys and gears to shafts, as pivot or hinge pins, clevis pins, cotter pins, shafts, and locating dowels.

Get the latest information about your application. Write to Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, New Jersey.

TRADE MARK

ROLLPIN

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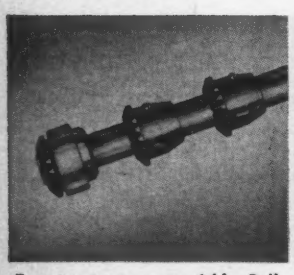
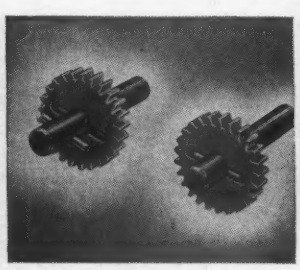
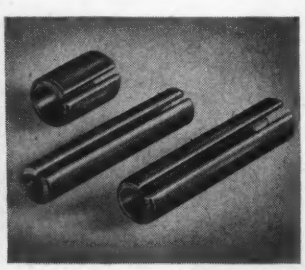


Twenty gears are quickly Rollpinned to farm-tool gear train shaft. Assembly time was cut . . . field service simplified, because Rollpins drive out readily.



Rollpin is used as a self-retained pin in shaft . . . which is press-fitted into recess molded into sintered gear. Unusual shear strength makes it ideal for this use.



Rollpins are supplied to specified lengths with chamfered ends. Available from stock in diameters from 5/64 inch to ½ inch in Carbon Steel and Stainless Steel.

TELE-TIPS

(*Continued from page* 8)

CR IMPLOSIONS — When TV was new, there was a great deal of fear that picture-tubes would implode and do damage and injury. But to date, after 15,000,000 sets have been in use, there are authenticated cases of only one or two actual "implosions". So the hazard ratio seems almost negligible.

LATIN AMERICA has six TV stations already—two in Havana, two in Mexico City and one each in Rio and Sao Paulo. Eighteen more are projected in major cities in seven countries and Puerto Rico. Total wired homes within a 60-mile radius of these 24 stations is 3,258,612, according to Philco International's R. L. Romeyn.

COBALT-PLATINUM MAGNETS, which in small sizes are declared to be the world's most powerful permanent magnets, have been developed by the General Electric Research Laboratory. Laboratory experiments with the new magnets about the size of an eraser on a lead pencil, and a similar sized Alnico-5 magnet, show the new magnet to have lifting power 24 times greater than that of Alnico-5, and about eight times more resistance to demagnetization. This coercive force enables the cobalt-platinum magnet to be more efficient in smaller sizes than any permanent magnet now in commercial use. Other advantages of the new magnet are its ductility, or ability to be drawn into wire or thin sheets, and its comparative ease of machining. Alnico magnets can be machined only with great difficulty.

DER KAISER 1ST ALLOCATOR! — "The service-allocation of the radio spectrum actually started in 1901 when the German Emperor invited representatives of several countries to Berlin to discuss frequencies to be used for ship communications" says FCCommissioner George E. Stirling. "It was not until a second conference was held in 1903 that agreement was reached covering the then known useful frequencies. This agreement was modified and expanded at the London Conference in 1912. These agreements, together with subsequent developments such as the discovery by the amateurs of the usefulness of the high frequencies above 1500 KC for long-distance communication, set the pattern for a table of frequency allocations formulated at a world-wide conference in Washington in 1927."

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Let's Work Toward a "United-TV-Industry" Compatible Color-TV System

An incompatible field-sequential color-television system has been authorized by the FCC.

This new FCC color-TV system is "incompatible" with FCC's own black-white TV standards,—which means that while such FCC color-TV programs are being broadcast, the present 13 million television owners will be deprived of use of their sets to see such programs until each present owner can find some technician* to rewire his set for an adaptor and a converter, at a cost of $100 to $250.

Even then, this FCC system with color disks is limited to picture sizes of 10 to 12 inches or less, whereas the demonstrated public demand is for larger and larger pictures,—19-inch, 21-inch and 24-inch.

★ ★ ★

Everyone wants good color television, as soon as possible—the Congressional Committees, the FCC, the public, and the TV manufacturers and industry.

But the present authorized FCC system has put the television public and the television industry on dead-center, as set-conversion difficulties, conflicting claims and legal battles all confuse the buying public. As a result, set sales are off and manufacturers and dealers are facing shut-downs and disaster. Both black-white and color television are today in a state of dead-lock.

Several practical compatible systems and partial systems have been developed and made ready for demonstration. Besides affording full compatibility with black-white programs, these systems permit the same large-size pictures as present black-white, and in fact operate at their best in the larger picture sizes.

★ ★ ★

As a way out of the present deadlock, we think the television industry should be called upon to study the best features of all the proposed compatible systems and to combine them into a "united-TV-industry" color-TV system, which can be presented to the FCC for approval, without prejudice. This great billion-dollar industry can marshall the world's greatest television engineering talent and apply it to this big problem of the industry, a compatible color-TV system.

Already the FCC has indicated its preference for a compatible color-TV system. And so has the Senate-appointed Condon technical committee.

And if such an industry-wide compatible system is offered, without individual labels, without personalities, but solely on its merits,—we feel sure the FCC, after viewing reasonable field tests, will authorize its operation.

With such a compatible color-system available to the television stations, a system by which over 13 million set owners can at once, without receiver changes or expense, view color broadcasts in black-white, and then convert to color-reception as soon as they desire,—

(1) Color-television will be rapidly adopted and immediately enjoyed by the American public.

(2) The set owners' investment of four billion dollars in present sets will be preserved without additional outlay, and

(3) The present FCC incompatible system will be forgotten, as the industry and public push toward all-electronic color-TV with full compatibility.

A majority of the TV industry is opposed to the FCC non-compatible system, a system which manifestly can be launched and operated only at great expense on the part of the public.

To serve "the public interest" which the FCC is sworn to safeguard, the whole TV industry—CBS, Du Mont, GE, Philco, RCA, Sylvania, Hazeltine and all others with engineering contributions—should now be called upon to come up with a united-industry compatible system that combines all the best engineering brains of the television art. The urgency of such an all-industry solution underlies the whole future of fullest television enjoyment by the American public.

O. H. CALDWELL, Editor

* We know of few or none yet so qualified.

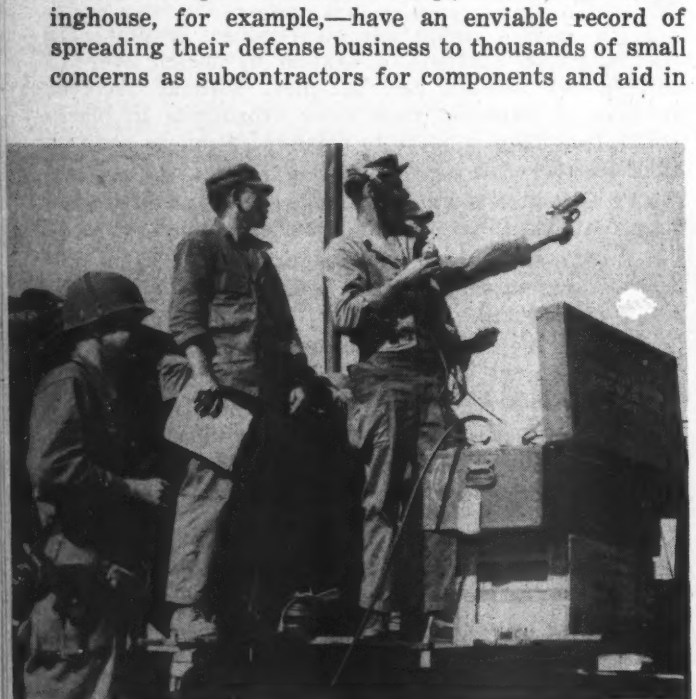
The RADARSCOPE Revealing at a Glance

THE PENTAGON

URGE SUBCONTRACTING—The Department of Defense and the leadership of the three Armed Services electronic-communications activities—Army Signal Corps, Navy Bureau of Ships and Aeronautics Electronics Divisions, and Air Force Air Materiel Command—thoroughly endorse the strong editorial position of TELE-TECH in advocating more defense contracts for small radio-electronic manufacturers as was voiced in the June issue of TELE-TECH. Our Washington news editor was advised by top-level officers of the three Armed Services' procurement branches in the radio-electronic-communications fields that their branches are continuously advocating to the prime contractors the paramount necessity of widespread subcontracting of the military-equipment contracts which are awarded.

RE-ARMAMENT

EXCELLENT RECORD—Actually—and despite the assertions of certain members of Congress—, the radio-electronic so-called larger manufacturers did a magnificent task of subcontracting in World War II and are performing in a similar excellent manner as the numbers of military procurement agreements has increased. These larger manufacturers—General Electric, Radio Corporation of America, Western Electric, Federal Telephone & Radio Corp., Philco, and Westinghouse, for example,—have an enviable record of spreading their defense business to thousands of small concerns as subcontractors for components and aid in assembling end-equipments. What these companies (as prime contractors) and the Armed Services both desire in the selection of subcontracting manufacturers are reliability of production and delivery and reliability of the components and equipment, together with quality and efficiency.



Makeshift control tower being operated by Airways and Air Communication Service (MATS) personnel at Kimpo airfield in Korea. Signalling equipment includes a Very pistol for signal flares, heliograph for visual signals and a type AN/CRC-2 radio set for direct communication with planes.

AVIATION

THE INCREASING USE of voice communications in aviation operations has already commenced to pose problems in language and intelligence transmission fields. The universal language of the "Q" code was understandable by every user; but voice has as yet no such code. Studies are being carried out by the International Civil Aviation Organization with the object of engineering an aviation language. In fact the term "language engineering" has been applied to them. The artificial language will have to overcome the drawbacks of English with its difficult constructions, and the result may well be a form of airborne Esperanto. Prediction: Before long, in addition to learning aviation matters at flight school, hopeful bird-men will also learn a new artificial language.

MOBILE

ROLE IN STORMS, DISASTERS—Mobile radio services, especially those operated by power utilities and police and fire departments, played notable role in recent winter blizzards and storms that engulfed the East and Middle West. Equipment of several leading mobile radio manufacturers—General Electric, RCA, Motorola, Link, Federal and Raytheon—operated most adequately during blizzards in the handling of communications for aid of public suffering, damaged property and restoration of power systems and telephone lines. FCC staff in charge of mobile radio services cited to TELE-TECH Washington bureau that this signified the public interest importance of these services and significance in national defense situation.

MANPOWER

ENGINEER DEFERMENT BILL as passed by the House of Representatives, provides that a man who is deferred for any period for occupational reasons because of employment in industry or training in college, shall be liable for induction until his 35th birthday. But the bill, as passed by the Senate, the Engineers Joint Council points out, did not contain this provision. The normal age-limit for induction in both the Senate and House variations of the bill is 26. While a great majority of all registrants will be deferred for one reason or another, including depend-

ency, no penalty is attached by the House amendment to any deferment except those granted on occupational grounds. Effects of this on industry, in its efforts to meet mobilization requirements, may be severe. Reports from large industries employing scientists and engineers indicate that they have been able to fill only one third of their current requirements for such personnel from June graduating classes—particularly since almost 30% of these graduates will enter the Armed Services because of ROTC or other reserve status. Any further inroads on the engineering and scientific personnel of industry will undoubtedly reduce sharply their ability to meet the military needs of the nation for preparedness items. It is believed that many young men essential to industry will refuse to accept occupational deferment because of the proposed penalty, and employers will not be able conscientiously to request deferment for an employee without his consent if it means a 9-year extension of liability.

BROADCASTING

FREQUENCY MODULATION is once more coming to the front, having registered for the first quarter of 1951 the largest receiver output in FM history. Beginning with June, 1950, there had been a distinct shortage of AM/FM models, but with recent expanded output, the industry is once more in an inventory position, and sets are available. FM has some geographical advantages which must not be overlooked, for there are specific areas in the country where AM reception is far from satisfactory—particularly such areas as North and South Carolina, where the AM signals from Cuba cause disturbing interference and make AM reception practically impossible at certain times. The acceptance of FM in such an area has been excellent and very substantial numbers of AM/FM units are being purchased and used.

TRAINING

ENROLLMENT of engineering students was stimulated by wartime conditions during the past decade, but is now beginning to drop because of "rumors" that there would be a surplus of engineers. It is estimated that 31,000 engineers will be graduated in 1951, but this will decrease to 15,000 in 1954. The number of high-school enrollments indicate further reductions beyond 1954, unless more high-school graduates go to college, or a higher percentage than formerly choose engineering courses.

All 1940-50 engineering graduates were absorbed readily into industry without lowering salary standards, and there is reason for believing that industry will continue to require a large number of engineers in the future for continuing technical progress.

TELEVISION EXCISE

IF TAX ON TV is intended to restrict production and thereby conserve critical materials and make productive capacity and labor available for production of war equipment, it is wrong. Such controls, where and if required, should be applied directly. A healthy radio-TV industry is essential for the production of the equipment required by the armed forces. If the industry is weakened and its labor force shrunk, by the deterring effects of this high tax, before the full demands are made upon the industry for war production, it may be unable to fully meet those demands.

COMPENSATION

PAY FOR PATENTS taken out by company engineers and employees has offered some knotty problems in the past. Such patents are usually based on work done on company time with company equipment. What then should be the personal compensation given the individual? Philco is one large producer which has developed a policy to reward internal inventive genius and to encourage the development of patentable ideas. For every patentable idea which is filed the company pays $100 to the inventor, plus an additional $50 when the patent is issued. All regularly employed members of Philco are eligible for these awards excepting officers, directors and members of the engineering executive committee of the patent department. In the last few years more than $77,000 has been paid to employees in the form of incentive awards for patent applications.

New FM system for Oberlin (Ohio) police by GE can at will alert town's volunteer firemen to respond to alarms. Ordinary police messages are not heard in firemen's homes.

What's the Score On DEFENSE CONTRACTS?

Defense planning agencies (see chart on opposite page) are making all-out effort to spread contracts; encourage subcontracting.

Army reveals small firms are getting 30.6 percent of defense business.

$2.35 billion has gone to thousands of small plants; current rate is estimated at $1.5 billion monthly.

However, small firms are still on short end of defense effort as shown by analysis of Army procurement actions.

By LT. COL. STANLEY GERSTIN, Manager, Government Manuals Division, Caldwell-Clements, Inc., New York City

ARMY PROCUREMENT—9 months ended 3/31/51 Fiscal Year*

	No. of Contracts	% of Contracts	Dollar Value	% of Dollar Value	Value Per Contract
Small Business	700,000	75.5	$2,348,500,000	30.6	$3,355
Large Business	228,500	24.5	5,326,500,000	69.4	23,300
Totals	928,500	100.00	$7,675,000,000	100.00	

* Present procurement rate: $1.5 billion monthly.

DEFENSE PLANNERS ARE staying awake nights trying to figure out ways and means to channel defense business in the direction of small firms.

The men who direct our defense planning and whose decisions affect every corner of our economy are shown in the chart on the opposite page: "Who's Who of Defense Planning Agencies." They make the rules and call the pitches. And they are sensitive to reactions from the bleachers and sidelines. The parallel to this observation is that they are sensitive to Small Businesses and their role in our defense effort.

During the past several months, TELE-TECH has editorially echoed the dissatisfaction of Small Business because it was not being called on to contribute its share in defense production.

In the radio-electronic equipment field much of the initial contracting went to a few large firms. In later developments Small Business came in for a larger share of prime contracts—and a vastly larger share of subcontracts.

The Department of Defense—the Office of the Secretary of the Army—particularly, has made an analysis of Small Business' role in the defense effort. We present some of the official statistics prepared by the Army in its study of contracting relations with firms employing fewer than 500 people.

During the first nine months of the fiscal year 1951, Small Business was awarded approximately 700,000 contracts (75.5 percent of the total) by the Army. The dollar value of these contracts was $2.35 billion (30.6 percent of the total). By projecting these figures, we find that firms other than those classified as Small Business received 228,500 contracts in the same period, with a dollar value of $5.33 billion (69.4 percent of the total).

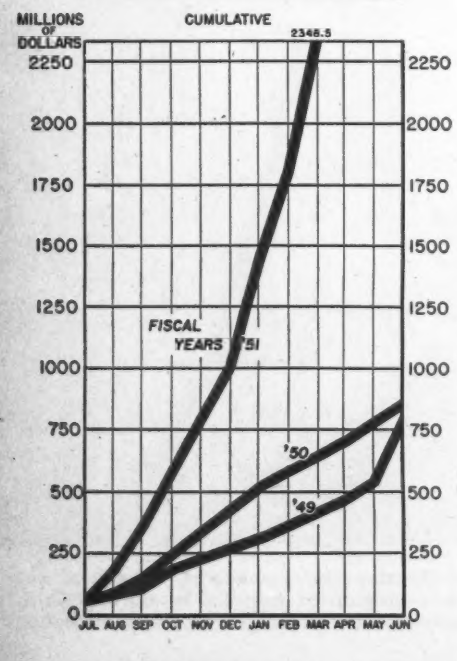
The figures look good—for defense planners, but an analysis reveals why Small Business — radio-electronic equipment manufacturers among them—are still writing to their Congressmen about the lack of defense contracts.

Average value of contracts issued to Small Business (according to Department of the Army reports) is $3,355. The average for big business is $23,500.

Closer analysis reveals that the 700,000 contracts with a dollar value of $2.35 billion awarded to Small Business in the first nine months of the 1951 fiscal year include thousands of small purchases made directly and locally by Army posts, camps and stations in amounts less than $1,000 each. These purchases do not directly contribute to the support of vital industries such as radio-electronic manufacturers with several hundred employees each who are

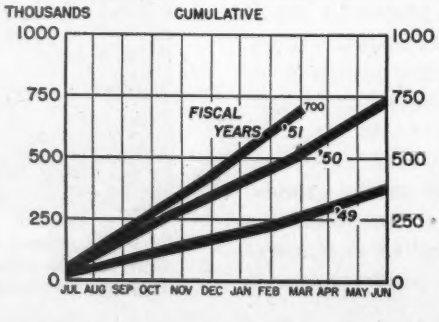
(*Continued on page* 58)

DOLLARS TO SMALL BUSINESS



Approximately 700,000 prime contracts of all types (below) valued at $2.35 billion (left) have gone to Small Firms

PRIME CONTRACTS TO SMALL BUSINESS



WHO'S WHO OF DEFENSE PLANNING AGENCIES

Chart shows TV-RADIO-ELECTRONIC industry life-line to top-level planning agencies responsible for analyzing military requirements, establishing material quotas for civilian and defense use, determining small business' role in defense production

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EXECUTIVE OFFICE OF THE PRESIDENT

EXECUTIVE OFFICE BLDG. Wash., D.C.
Phone: EXecutive 3300

National Security Council
Nat'l Security Resources Board
Council of Economic Advisors
Bureau of the Budget

CONSULTS WITH THE PRESIDENT ON NATIONAL AFFAIRS

NATIONAL ADVISORY BOARD ON MOBILIZATION POLICY

17 REPRESENTATIVES OF BUSINESS AND LABOR ADVISE THE PRESIDENT ON DEFENSE PLANNING

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EXECUTIVE OFFICE BLDG. 17th & Penn. Ave., N.W., Wash., D. C.
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CHARLES E. WILSON, Director

Rm 102	Ext 2101	Code 189
Rm 100 1/2	SIDNEY J. WEINBERG, Spec. Asst.	Ext 2131
	HOWARD CHASE, Asst. to the Director	Ext 471

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ADVISORY FUNCTION ONLY. COMPOSED OF DIRECTORS OF VARIOUS AGENCIES SHOWN ON THIS CHART

DEPARTMENT OF DEFENSE

PENTAGON Wash., D.C.
Phone: Liberty 5-6700

GEN. GEORGE C. MARSHALL, Secretary
Rm 3E880 Ext 55261 Code 131

ROBERT C. LOVETT,
Rm 3E928 Deputy Ext 56352

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LAFAYETTE BLDG.
811 Vermont Ave. N.W., Wash., D.C.
Phone: REpublic 7500

Rm 315 **ERIC JOHNSTON, Director** Ext 4147
WAGE AND PRICE CONTROLS

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Phone: STerling 5200

EDWIN T. GIBSON, Acting Director
Rm 206 Ext 4423 Code 141

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OFFICE OF SMALL BUSINESS

J. C. PRITCHARD, Director

STAFF FUNCTION OVER OFFICE OF SMALL BUSINESS — SEE UNDER NPA

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PRODUCTION EXECUTIVE COMMITTEE

W. W. WATTS, Chairman
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COMMERCE BLDG.

HORACE B. McCOY, Administrator
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COMMUNICATIONS EQUIPMENT—
L. M. HILL Ext 4128
TIN, LEAD, ZINC—W. H. HOPTON Ext 3897
LIGHT METALS—M. H. BELL Ext 3530
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NATIONAL PRODUCTION AUTHORITY

COMMERCE BLDG. 14th & Penn. Ave. N.W., Wash., D. C.
Phone: STerling 5200

MANLY FLEISCHMANN, Administrator

Rm 5802	Ext 4461	Code 141
Rm 5100	THOMAS N. NICHOLLS, Deputy	Ext 4476

INSURES THAT PRODUCTION MATERIALS AND FACILITIES FOR REARMAMENT ARE MET ON SCHEDULE; SUPERVISES DISTRIBUTION OF NON-DEFENSE SUPPLY OF CRITICAL MATERIALS; PROMOTES MEASURES FOR EXPANSION OF PRODUCTION CAPACITY AND SUPPLY OF MATERIALS NECESSARY FOR NATIONAL DEFENSE

OFFICE OF SMALL BUSINESS

COMMERCE BLDG.

JOHN C. PRITCHARD, Director
Rm 3310 Ext 4561

ASSURES PARTICIPATION OF SMALL BUSINESS IN PRODUCTION OF CIVILIAN AND DEFENSE GOODS; ASSISTS SMALL FIRMS TO PARTICIPATE IN DEFENSE PRODUCTION; DEVELOPS CONTRACTING AND PROCUREMENT PROPOSALS TO INSURE PARTICIPATION OF SMALL BUSINESS AS PRIMARY AND SECONDARY DEFENSE CONTRACTORS

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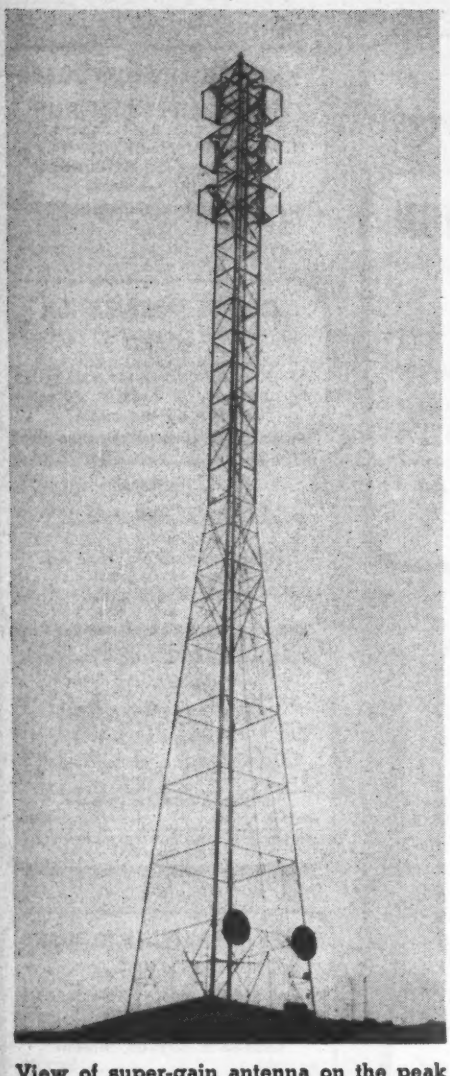
Directional Operation Planned fo

Farsighted technical design prepares for day when FCC will permit restricted radiation over land areas only



View of super-gain antenna on the peak of San Bruno Mountain, San Francisco

By R. A. ISBERG, Chief Engineer KRON-TV, San Francisco, Calif.

DOMINATING San Francisco's southern skyline is San Bruno Mountain, the peak of which is marked by the KRON-TV, KRON-FM, and KNBC-FM antennas. This location is expected ultimately to become the center of population as the bay area expands, and it was also chosen because of propagation and multipath considerations.

The terrain of the metropolitan bay area is very hilly, a condition which complicates home reception problems. San Francisco is situated on the northern end of the San Mateo peninsula, and like Rome is built upon seven hills, ranging in height from 200 ft. to 900 ft. above sea level.

To the south of San Francisco San Mateo peninsula is suburban and is densely populated on the relatively flat side adjacent to the San Francisco Bay. The side of the peninsula which is adjacent to the ocean is mountainous and sparsely populated. Some of these mountains are over 2600 ft. high. The east bay regions comprising the cities of Vallejo, Richmond, Berkeley, Oakland and Alameda are built on the slopes of another mountain range with elevations up to 1800 ft. And away to the north, the bay regions are very mountainous and sparsely populated except in the valleys.

At the transmitter site, only four miles from the ocean, a very low density of population exists. Since it appeared unwise to expend a large percentage of the station's power over the ocean, RCA engineers suggested that a directional antenna be considered to increase the radiated power over the populated areas.

The RCA TF-DA "Super-Gain" antenna was chosen because it provides flexibility in producing the type of pattern required. Due to the FCC freeze it was not initially installed as a directional antenna but is expected to be directionalized after restrictions are removed. The directional pattern will provide a maximum signal of 100 KW ERP over both San Francisco and the south bay regions, and only 3KW ERP toward the ocean.

A 200-ft. antenna tower was designed and built to RCA specifications by Ideco and positioned for the ultimate directional pattern. The top 100 ft. of the square tower are of uniform cross section and will support an 8 section channel 4 Super Gain antenna.

Each dipole is supported by 4 parallel tubes forming a vee. Adjustable shorting bars at the base of each pair of tubes are provided for stub tuning. A single RG-34/U coaxial transmission line passes through one of the supporting tubes and the outer conductor connects to one half of the dipole and the inner conductor connects to the other half of the dipole through a connecting strap. The inner conductor may be connected either directly to the dipole or through a coaxial stub section which can be located in one of the supporting tubes.

Additional reflector screens extending away from the corners of the main reflecting screens at a 45° angle are provided to reduce coupling between adjacent dipoles.

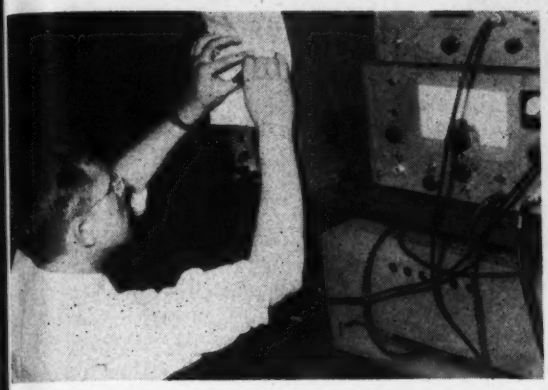
The RG 34/U transmission lines for each dipole are of the same length and terminate in junction boxes, one for the North South dipoles and one for the East West dipoles. A broad band coaxial line impedance transformer raises the low impedance at the junction box to 51.5 ohms in several steps. This is accomplished by utilizing various diameter inner conductors to increase the impedance in a series of steps until the desired 51.5 ohms is reached.

Feeding Transformer Assemblies

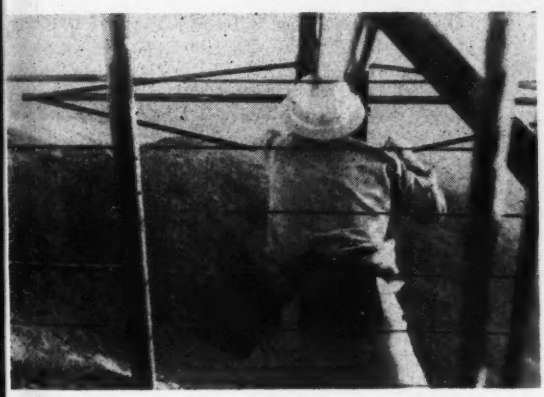
One of the transformer assemblies is supplied with an additional ¼ wave section of 51.5 ohm line to feed the EW radiators in quadrature. The transformer assemblies are fed by a power equalizer assembly and a single 3⅛ in. transmission line connects it to the transmitter. The power equalizer consists of a bridge type network which causes equal power to be supplied to the EW and NS radiators. If a mismatch occurs in the antenna, the reflected power is absorbed in a terminating resistor; otherwise it would be reflected back down the line to the transmitter and cause degradation of picture quality. In practice this amount of reflected energy is very small and causes the resistor's temperature to rise only a few degrees.

In the KRON-TV installation, the power equalizer and transformer assemblies are mounted on supports adjacent to the ladder inside the tower. By utilizing spring supported coaxial line hangers as well as rigid clamps the entire assembly can be easily taken apart for maintenance or inspection. Several instances of trouble have occurred which have been easily repaired in a minimum amount of time by one man with only a short

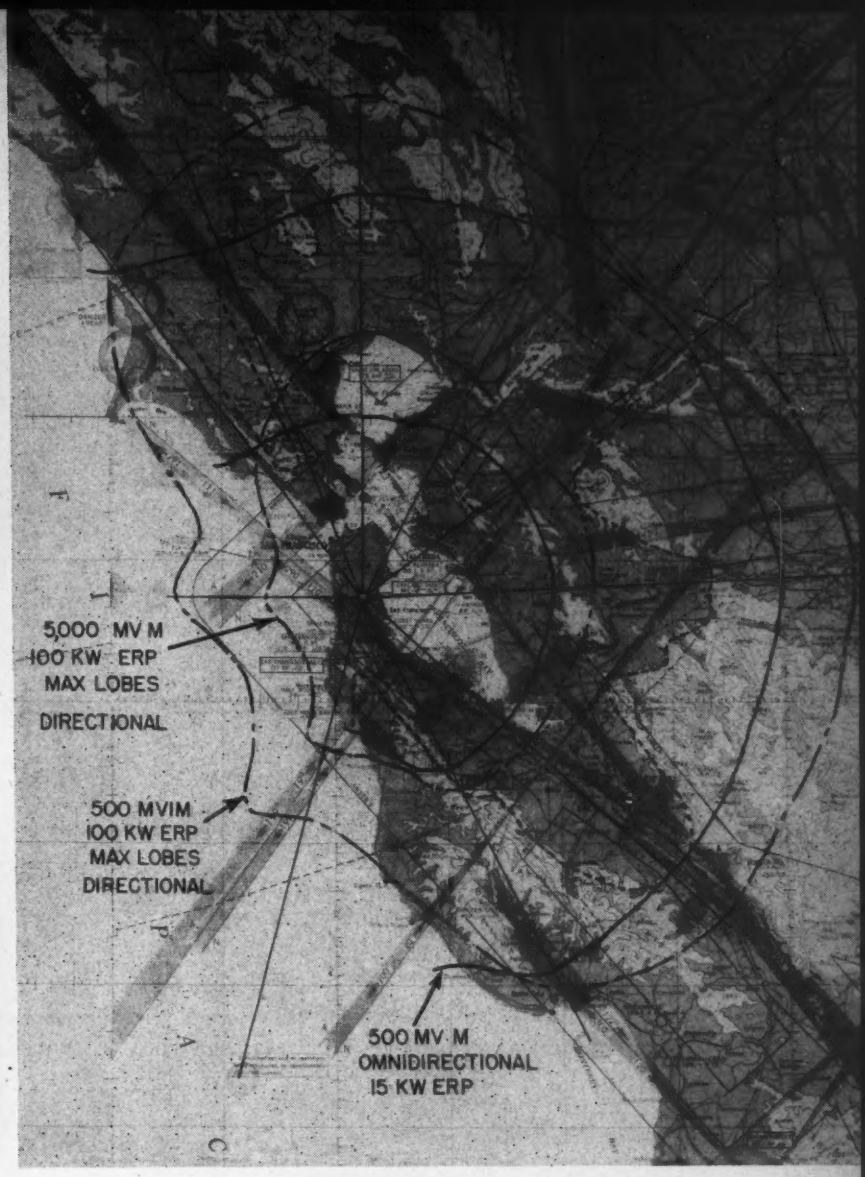
for KRON-TV



Making impedance measurements on antenna



Rear view of radiator seen through reflector



Contour map shows directional and non-directional operations

piece of rope for rigging. Had the assembly not been mounted with maintenance in mind, two or more men with rigging equipment would have been necessary. However, it is imperative that the transformer assemblies be rigidly clamped in position so that the transmission line can not vibrate in the wind. The spacing between the outer conductor and the inner conductor is small at the junction box end. The assemblies should be carefully inspected after shipment, and again after installation, to be sure that the soft copper outer conductor is not dented.

The single 3⅛ in. transmission line is 318 ft. long, and, except for two special angles at the base of the tower, is a continuous run. Heat expansion and contraction is provided for by use of sliding brackets for the horizontal runs of line at the base of tower. The line is supported by two rigid clamps on the top section, and by spring suspensions for the remainder of the vertical run. The line is bowed over a distance of several lengths at the 100 ft. level because of the change in angle of the legs and ladder at this level. It is thus kept near the ladder for its entire length. If a special angle had been used, an impedance discontinuity might have been introduced. It is very desirable to limit the number of angles in a line, and to check each one that is used for its effect on the standing wave ratio. Other items which should be checked are, 3⅛ in. to 1⅝ in. tapers, gas blocks and inner conductor connectors. The tapers used should be the long type, especially if used at the end of a line. The gas blocks should be carefully inspected to be sure that the screw type inner conductor connections are clean and tight. Several types of inner conductor connectors are sold under the same part number. One type which it seems advisable to avoid is a copper sleeve slotted the entire length which contains a steel spring. The dimples in the copper sleeve are rounded and can easily be forced into the inner conductors thereby causing a high resistance connection. This condition may cause heating, loss of temper of the spring, an arc, and then destruction of the inner conductor of the line. Or it may manifest itself as a troublesome variable standing wave ratio.

Other Connectors Satisfactory

Several other types of connectors are satisfactory; the slotted phosphor bronze type, the spiral phosphor bronze type, and the improved soft copper and steel spring version. The latter type no longer has the slot extend the entire length and hence cannot be easily forced into the inner conductor.

A necessary tool for routine checks on the dc resistance of a transmission line is a low resistance bridge. Since values of resistance of a few thousandths of an ohm are involved, the Kelvin type of resistance bridge is preferred.

The transmission line and antenna

(*Continued on page* 76)

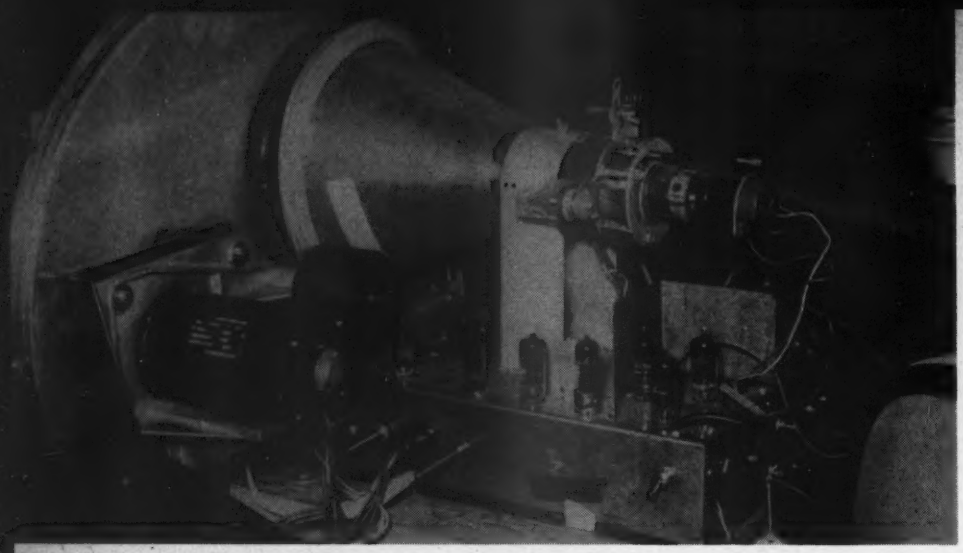
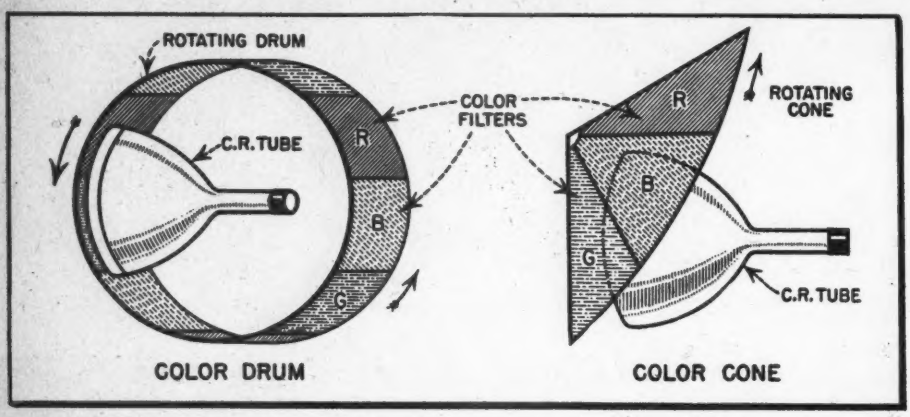


Photo showing 8½ in. converter chassis mounted in place behind rotating disc assembly



Sequential color TV is not restricted to discs. Left, a drum encloses the tube. Right, a cone set at one side of the tube reduces the cabinet size required

Latest

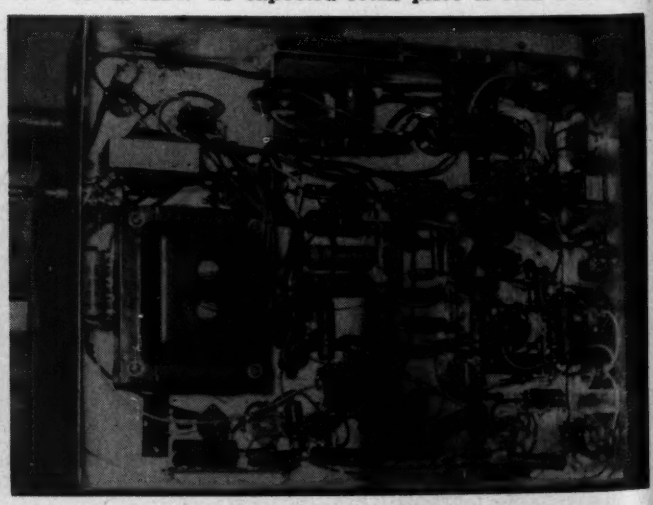
Supreme Court sustains

THE decision rendered by the Supreme Court of the United States on May 28 enables CBS to go ahead with commercial color television broadcasts. The court in making this 8 to 0 decision did not rule on the merits of the system, but rather, found the FCC well within legal rights in giving CBS permission to go ahead initially. Justice Felix Frankfurter, in regarding a separate opinion, suggested that it might be more in the public interest if the FCC had ordered a delay in color television until something better than an incompatible system had been perfected.

The news was received throughout the industry with mixed emotions. RCA announced that it would now go ahead with public demonstrations of its improved compatible all electronic system. Dr. W. R. G. Baker, speaking for General Electric, said it would be impossible to reach any immediate conclusions as to future color television plans now since the decision has come in the same month that NPA placed restrictions on all television broadcast construction projects; when CMP regulations, after July 1st (steel, copper, and aluminum), give no assurance as to material availability for TV set production; and when the Federal Reserve Board has refused to ease Regulation W restrictions which in turn have effectively dropped consumer ability to purchase standard TV receivers to an all time low. Other companies whose spokesmen indicated that they had no immediate plans to manufacture adapters, converters or complete receivers for CBS color TV include: Allen B. Du Mont Laboratories, Inc., Fada Radio & Electric Co., Bendix Aviation Corp., Emerson Radio & Phonograph Corp., Pilot Radio Corp., Freed Radio Corp., Admiral Radio Corp., Motorola, Zenith Radio Corp., The Hallicrafters Co., Philco Corp., Westinghouse Electric Corp., and Sylvania Electric Products Inc.

Early in June, Air King Products Co. Inc. of Brooklyn, N. Y., unveiled the first of the two color television receiver models it expects to have available by late summer or in early fall. These are 10-inch receivers that use a rotating disc which when viewed through a built-in magnifier,

Top and bottom views of 8½ in. TV color converter chassis now being engineered at Air King Products, Inc. A built-in magnifier provides a picture for viewer equivalent in size to that obtained on a 10 in. tube. Its expected retail price is less than $200



Color Television Developments

CBS color, but more delays are evident. Industry proposes new compatible system

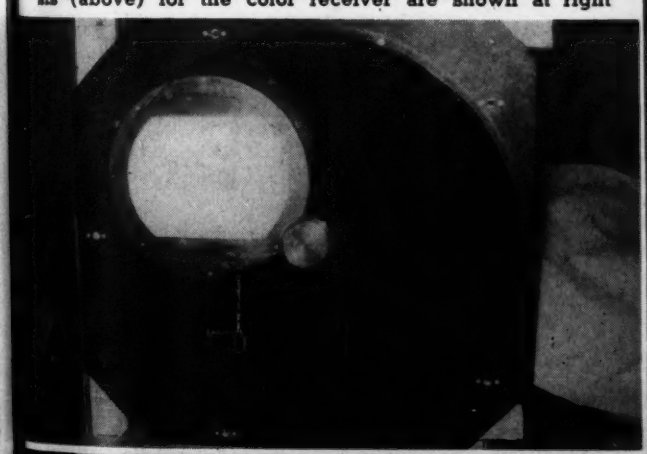
offer the equivalent of a 12 in. picture. Photographs appearing on these pages illustrate the physical appearance of this unit which is expected to sell for $499.95. The second model will have a cabinet without doors and is expected to retail at $399.95. A slave-set or converter employing an 8½ in. picture tube is also being engineered for production. This unit also has a rotating disc and a magnifier to give an apparent picture size equivalent to that of a 10 in. picture tube. It is expected to retail at under $200.00. Other organizations announcing that they expect to manufacture adapters, converters or color receivers for CBS color TV in the near future include: Tele-Tone Radio Corp., (converters); Celomat Corp., (converter kits-color wheels); Tele King Corp., (converter); Television Equipment Corp. (Automatic black and white-color changeover switch); Stewart-Warner Corp. (adapters); Chromatic Television Labs. Inc. (receivers with tri-color tubes) and John Meck Industries (converters). As we go to press, a new NTSC color system has been announced and the General Electric Co. has indicated that it will begin experimenting with this new color television system as soon as possible. A report on this new industry proposal for a compatible color television system follows.

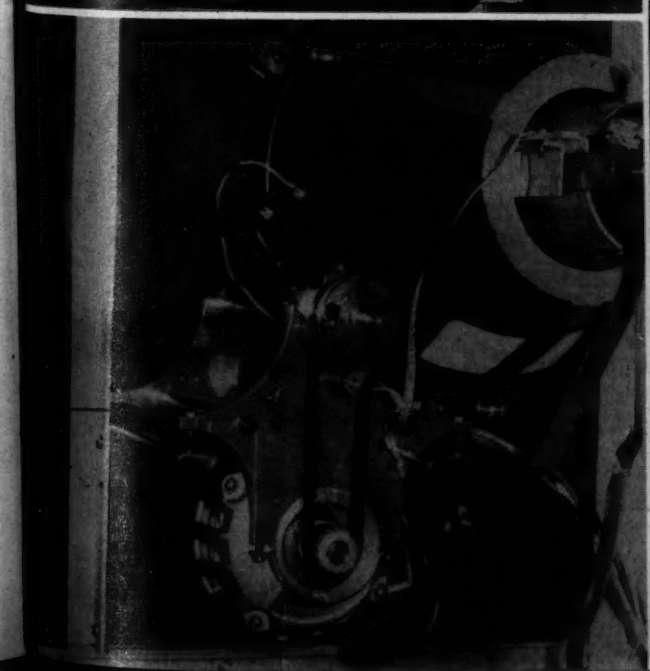
Proposal for Compatible System

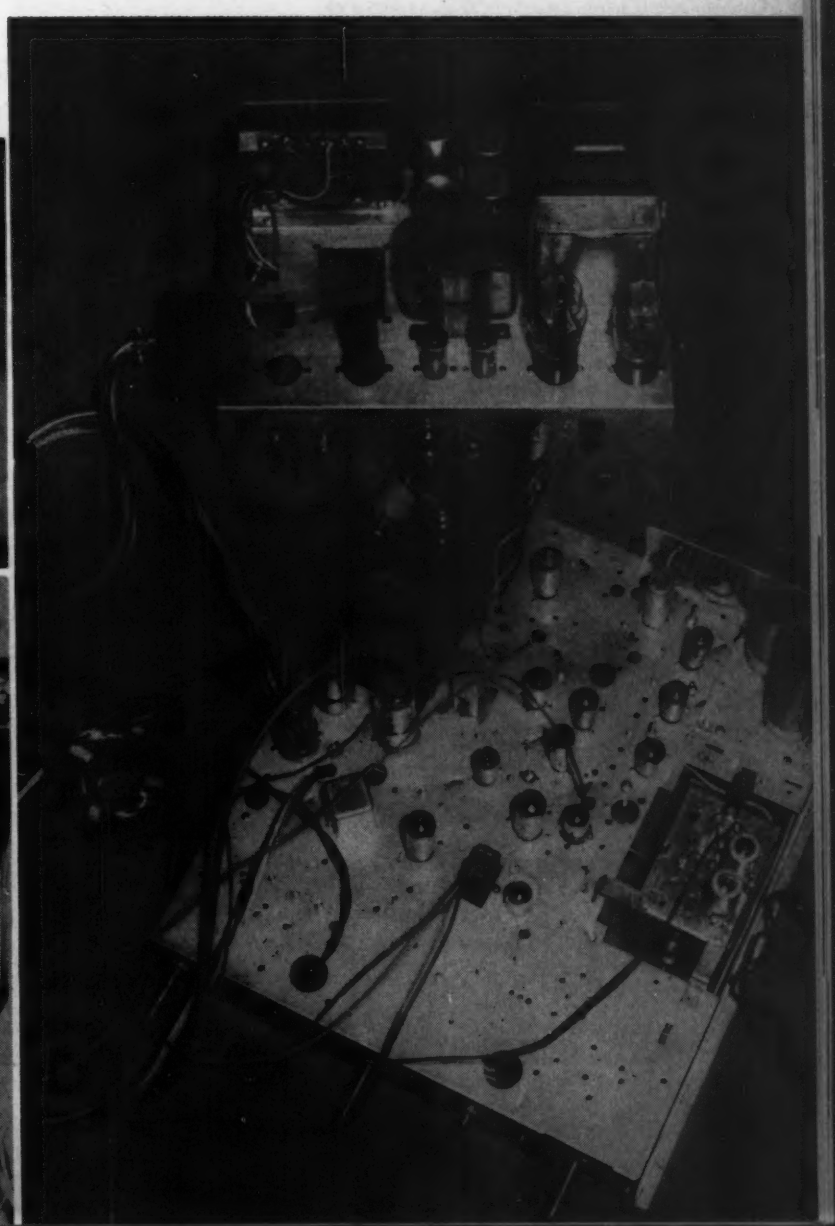
UNDER the aegis of the National Television Systems Committee an *Ad Hoc* sub-committee was set up on November 20, 1950 to study the

(*Continued on page* 74)

Major chassis elements comprising Air King's new 10-in. color television receiver. Upper left photo shows rotating disc assembly mounted alongside the picture tube. Two discs are employed, the outer one a driven disc while the inner one is a sliding disc. For color operation, discs sliding with relation to each other make the assembly a complete six segment color filter. For black and white operation, discs are stationary with colorless filter section exposed before tube. Rear view in lower left photo shows drive motor belted to disc driven shaft. Motor control generator, also mounted on this shaft, generates pulses that are fed into afc circuit for comparison with transmitted vertical sync. Control voltage so obtained actuates a vacuum tube having a saturable reactor in its plate circuit. Reactor, being in series with motor and line, controls speed of the induction motor by varying line voltage. Main chassis (below) and power supply chassis (above) for the color receiver are shown at right







Low-Voltage Tunable X-Band

New PAX3 types weigh less than 2.5 lbs, are tunable power output of 50 watts minimum. Stability is ±3

By GEORGE A. ESPERSEN and BERNARD ARFIN

Philips Laboratories, Inc., Irvington on Hudson, N. Y.

THE heater power limitation is severe and a cathode as thermally efficient as possible is required especially since in this low power tube, heating of the cathode by back bombardment by the out-of-phase electrons is negligible at the duty cycles encountered. A conventional single helix tungsten heater coated with aluminum oxide designed for this magnetron, operated at 6.3 v, 290 ma, meets the specifications.

The rigidity and concentricity of the cathode (Fig. 1a) is assured by supporting it axially between ceramic spacers which are firmly seated in the recessed pole pieces.

The coupling of the tube to the external circuit must be designed to keep the pulling figure within the required 6 MC, and at the same time should give as high a circuit efficiency as possible. Two approaches to this problem were considered. The first method was to use a simple quarterwave, parallel plate transformer, and the second was to use a stabilizing cavity[3]. In the limited time available for this development no clear cut advantage of the stabilizing cavity output was discovered; and because of the greater simplicity and ease of fabrication of the quarterwave transformer, this type of output has been used on the final developmental design.

To achieve a pulling figure of 6 MC with a quarterwave transformer, a transformer height of .043 in. was considered from empirical knowledge to be a good trial size and the standard X band waveguide width of .900 in. was used for broad dimension. To calculate the length of the transformer, the formula for the TE_{10} mode is used:

$$\lambda_g = \frac{\lambda}{\sqrt{1 - \left(\frac{\lambda}{2_a}\right)^2}} \quad \ldots\ldots\ (15)$$

$$\lambda_g = \frac{3.22}{\sqrt{1 - \left[\frac{3.22}{2(.9)(2.54)}\right]^2}} = 4.54 \text{ cm.} \quad \ldots\ (15_a)$$

$\lambda_g/4 = .447$ in

From previous experience with X-band tubes[3] the transformer is empirically made .011λ_g (=.020 in.) shorter than ¼ guide wave length (.447—.020). The length of the transformer section is thus equal to .427 in. This transformer shown in Fig. 1c.

Since the magnet requirements, to a large extent, determine the final tube weight, tests were undertaken to bring the magnet weight down to as low a value as possible, consistent with the other requirements. In order to reduce the magnetomotive force a set of conical pole pieces[4] was chosen for the final model (Fig. 1d). It is important that the field be essentially uniform in the region of the interaction space to prevent electrons from spiralling out to the pole pieces. A very slight barreling in a convex sense around the cathode to achieve a focusing effect axially toward the center of the cathode is desirable to prevent the poor behavior at very low voltages known as the "Gadarene effect."

The air gap should be as short as possible with a small area and low

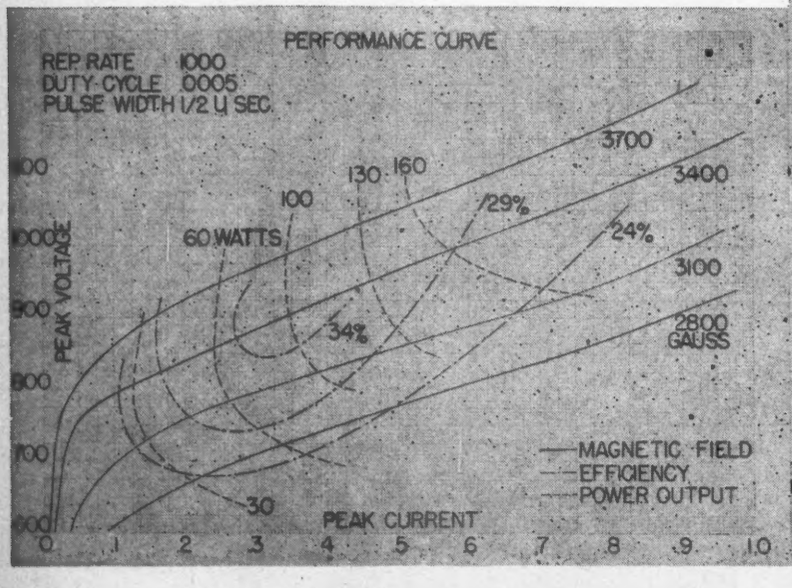


Fig. 4 (below): Typical performance curves. Tube will operate with nearly 30% efficiency at 800 volts and a field of 3100 gauss

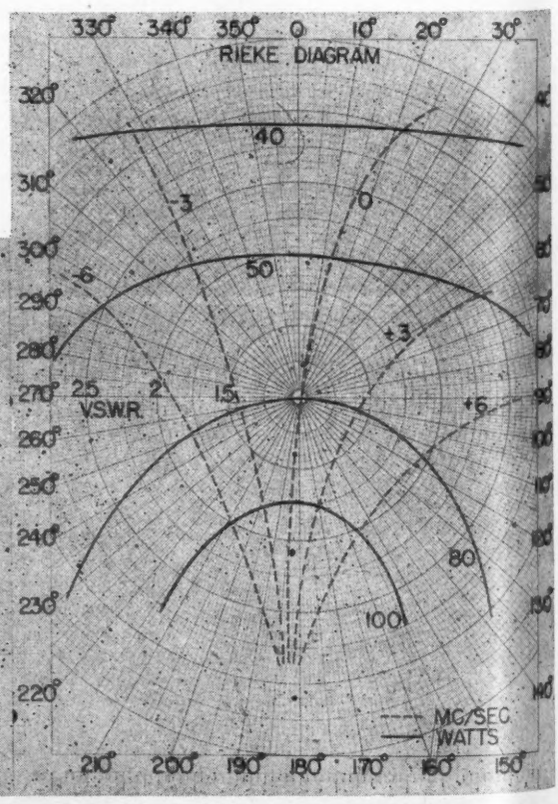


Fig. 5: Rieke diagram shows pulling figure to be approximately 6 MC, thus meeting specification

Magnetron Development

PART TWO OF TWO PARTS

from 9300 to 9320 MC, and have peak MC over a ±40° C temperature range

leakage factor. However, the anode end spaces must be satisfied from an electrical standpoint; that is, end space resonances which might lead to mode instability must be avoided. In this tube the anode end spaces were not found to be critical and a gap of 0.300 in. was chosen. This left end spaces of .050 in. each. The equipotential plot as obtained from an electrolytic field mapping wedge tank[5] for these conical poles and a 0.300 in. gap is shown in Fig. 2 and is satisfactory.

A horseshoe Alnico V magnet as shown in Fig. 3 was chosen. The weight of the magnet is $1\frac{5}{16}$ lbs. and it can easily supply the needed field.

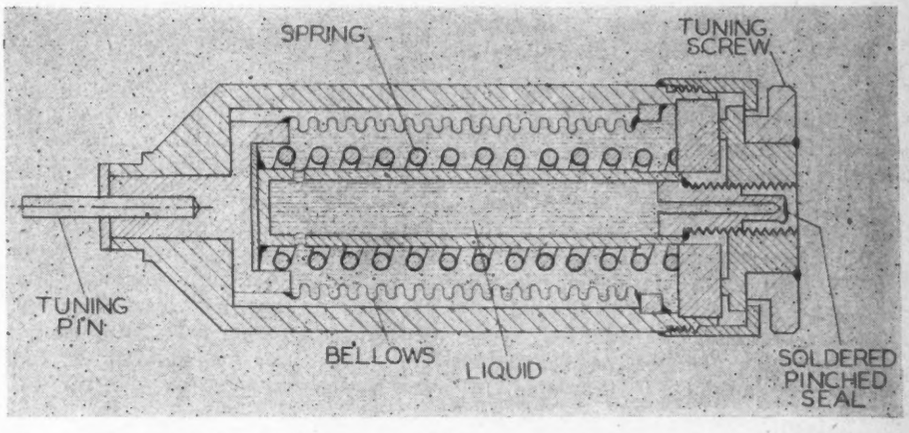


Fig. 6: Simplified drawing of tuner. With increasing temperature bellows liquid expands, thus inserting tuning plunger to effect compensating frequency increase

Frequency Range Restricted

Studies have been made on the cold test bench of various schemes for tuning this magnetron over the required range of from 9300 to 9320 MC. The tuning range is so restricted that it is entirely feasible to obtain adequate tuning and temperature compensation by means of tuning in a single anode resonator. Four variations in this tuning method were investigated. In the first two variations a plunger was introduced into the open end of a single large resonator and a single small resonator respectively, similar to the arrangement used in each cavity in "crown of thorns" tuning. A spurious resonance was noticed at one particular plunger position in each case, which made these methods unusable.

In the other two methods of tuning studied, a pin was introduced radially from the outer diameter of a single large resonator and a single small resonator respectively. Both methods appeared useful from the results of the cold test study since the Q factors were not radically affected through a useful range of tuning. For our purpose it was concluded that tuning in a large resonator was the most satisfactory.

Using this tuning method the frequency is increased as the pin is inserted. The frequency change per unit insertion varies with the cross-sectional area of the tuning pin.

A tuning pin .06 in. diameter, with a radial motion of .100 in. gave a frequency range of 12 MC. A rectangular pin .060 in. thick by .125 in. wide was tested with a resulting range of 65 MC. A pin .060 in. by 180 in. gave frequency range of 80 MC. The largest tuning pin did not seem to affect the operating characteristics of the tube, although it decreased the efficiency slightly.

In fabricating the tubes, the frequency will be found to differ slightly from tube to tube. It is therefore desirable to have a large tuning range so that the nominal frequency may be obtained by tuning. For this reason it was decided to use the largest pin.

Changes in Anode Block

In the temperature range through which the tube was required to operate, the frequency will vary due to expansion or contraction of the anode block. The temperature coefficient of the tube was found to be 0.3 MC/sec/°C. The allowable coefficient is .075 MC/sec/°C. It was thus found necessary to incorporate a temperature compensating device in the tuner.

A simplified drawing of the tuner is shown in Fig. 6. It operates in the following manner. An ambient temperature increase lowers the frequency of the tube by expanding the resonators. This temperature increase at the same time expands the liquid in the bellows, thus inserting the tuning plunger which effects a compensating increase in frequency. By selecting a liquid with the proper volume temperature coefficient approximate temperature compensation is achieved.

Fig. 4 shows the performance chart of one of the final tube models. It can be seen that the tube will operate satisfactorily at 800 volts at a field of 3100 gauss with an efficiency of nearly 30%. In the Rieke diagram (Fig. 5) the pulling figure is seen to be approximately 6 MC, which meets the required specification. Table I contains a summary of some typical characteristics of the PAX3 magnetrons submitted to the Air Materiel Command at Wright Field.

The authors wish to express their appreciation for many helpful discussions on this development to W. E. Lamb and other members of the Columbia Radiation Laboratory, and to C. M. Veronda, who was responsible for a considerable portion of the work. We also wish to express our thanks to the members of Philips Laboratories, Inc., who contributed to this development.

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Errata for Part One appear on page 70.

This work was carried out in fulfillment of Air Materiel Command Contract W33-038 ac-15043.

A Day with UHF-TV at KC2XAK, Bridgeport

By JOHN H. BATTISON,
Associate Editor

A DEMONSTRATION by the Standard Coil Company of their new UHF conversion strips for use in the Standard TV Tuner provided an opportunity to check at first hand the operation and progress of UHF-TV in the field. After the demonstration was over the author visited the home of Rudy Frank, Sales Promotion Manager of WELI, New Haven, which has become a sort of *Mecca* for engineers interested in UHF-TV reception. As will be described later, various receivers and conversions were observed in operation.

Fig. 1 shows a typical VHF Standard Tuner with one of the strips removed ready to receive the UHF strip illustrated in Fig. 2. At the demonstration a Muntz chassis, removed from its cabinet, was shown in operation on channel 4. While the receiver was still operating the chassis was turned on its side and the VHF channel 12 strips (two sections) removed by releasing the end clips. The UHF strips were then pressed into position, the chassis turned the right way up again, and the turret rotated to put the UHF strips in the operating position.

Adjustment, by an insulated trimmer screwdriver, of the oscillator fine tuning (through the front of the chassis) brought the UHF signal in clearly, and the oscillator was adjusted to put the carrier in the center of the tuner fine tuning range. The conversion was not timed, but was carried out before fifteen TV engineers and members of the press, who continually interrupted the demonstration with questions.

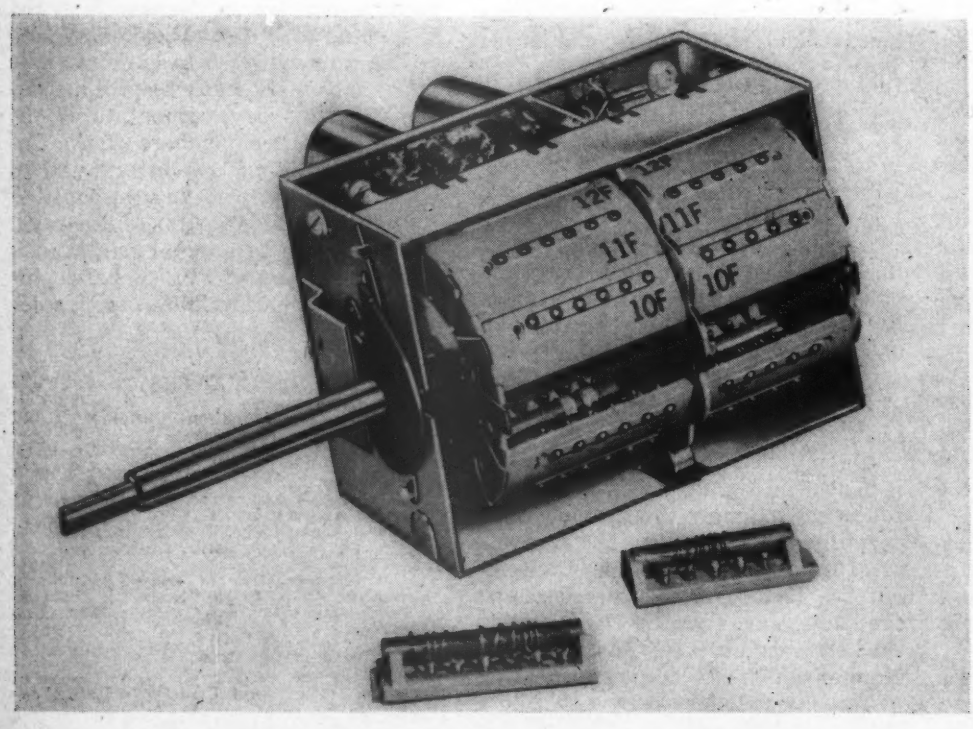
Same Receiving Antenna

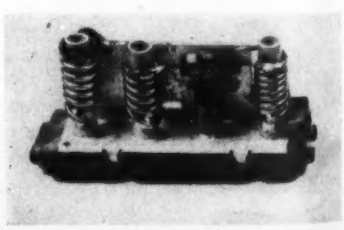
The demonstration was held at the Stratfield Hotel, about five miles from the UHF transmitter. The same VHF antenna was used for the VHF as well as the UHF tests. It was understood that the UHF station was located to the rear of the antenna and reception of it was by the back-beam with at least a 6 db ratio.

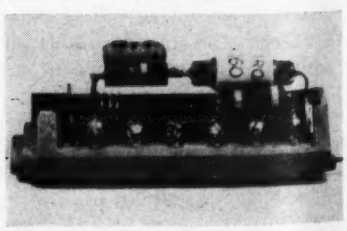
The VHF picture was weak and marred by much ignition and other industrial static; sound was good. A fair estimate of signal strength would probably be about 500 microvolts. The UHF picture was strong and clear with no traces of interference and with good contrast. Sound was a little weaker before adjustment of the volume control. Everyone was apparently impressed with the quality of the UHF signal and the ease with which the conversion was made. It would certainly seem that any receiver owner who has a turret tuner in his set would be in a good position if, and when, UHF-TV reaches his neighborhood. However, as will be mentioned again later in more detail, since the signal strength of the UHF station was so much greater than that of the VHF (Bridgeport to Bridgeport; versus New York to Bridgeport) no true comparison was possible.

At Mr. Frank's home the author, and a few other members of the party, were privileged to see three receivers operating on UHF and VHF; these were a Zenith, a Philco, and an RCA. The Zenith receiver had been modified by the addition of a UHF strip for the Bridgeport station. It produced first class pictures with either a VHF or UHF antenna. The RCA receiver operated with the latest RCA converter which does not have to run continuously and produced very good pictures. It was not possible to observe its operation on a VHF antenna since its input impedance of 72 ohms did not match the VHF line.

(*Continued on page* 73)







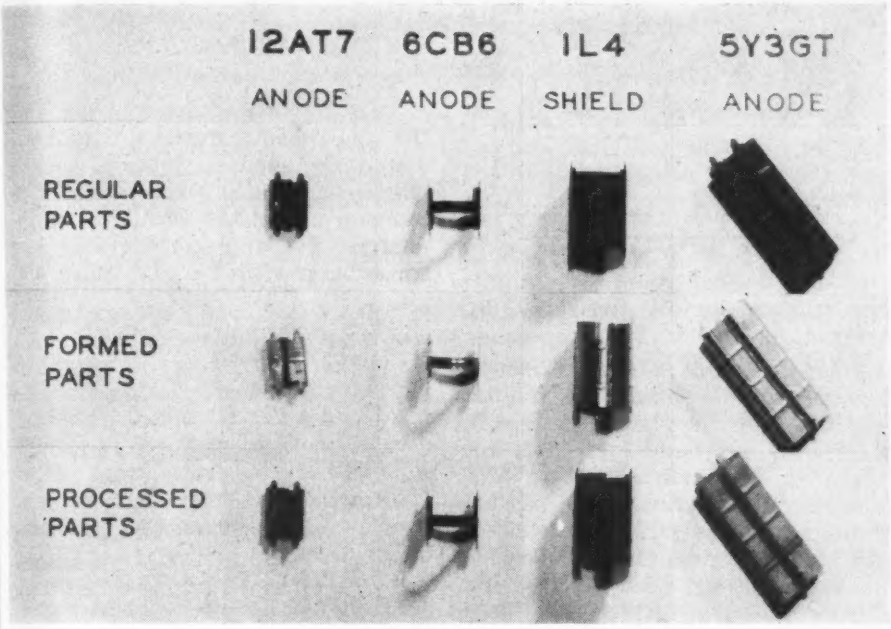
Above: The two section Standard Coil UHF-TV tuning strips. In effect these strips turn TV set into a double conversion circuit. A CK710 diode is used as converter

Left: Standard Coil Company's VHF-UHF-TV tuner with set of VHF strips removed to allow insertion of UHF tuning strips shown at right. Conversion takes less than 10 min. under normal conditions

New Vacuum Tube Materials

PART TWO OF TWO PARTS

Describing latest developments in aluminum-clad iron that replaces nickel



Comparison of standard and aluminum-clad iron tube parts

By A. P. HAASE, and E. B. FEHR,
Special Development Sec., General Electric Co., Owensboro, Ky.
Tube Div. Headquarters, General Electric Co., Schenectady 5, N. Y.

THE second material we wish to describe is really quite old and is reasonably well-known to the vacuum tube industry of Europe. Approximately five years ago, M. J. Gross isued a report on "New Vacuum Tube Techniques of Telefunken" which mentioned, among other things, the use of aluminum-clad iron as an anode material. This report was widely circulated within the vacuum tube industry in the United States, and considerable effort was devoted to the study and evaluation of such a material for use in American-made tubes. At the time most of this work was done, several of the largest suppliers of rolled metal products were contacted, and their cooperation in the production of this material was obtained. Unfortunately, the method of cladding which was decided upon had some serious limitations from the material application standpoint. A review of patent literature has revealed the use of a cold-rolling method which had been used in Germany since 1927 for cladding iron with aluminum. An inmprovement was issued in Germany in 1935, and in 1942 Weber and Herrmann made certain observations regarding methods for obtaining improved radiation characteristics from such material.

The aluminum-clad material[1] manufactured in this country has been found to have an iron-aluminum compound in addition to the core and cladding sheets. This interfacial compound has the general characteristics of $FeAl_3$, although some disagreement of this identification has been evidenced recently by others working with this material. The compound is very brittle and abrasive and tends to make aluminum-clad iron formed by the American method too stiff for easy fabrication of vacuum tube components and too abrasive for satisfactory precision die life. In order to understand the phenomena responsible for the difficulties of application of the material formed by the American method of production, consider Fig. 9, which shows the detail of the aluminum-iron constitution diagram for low percentages of iron. This portion of the FeAl diagram can be considered to represent the aluminum boundary of the clad iron material. From this diagram it can be seen that an iron-aluminum compound forms at 655°C. The molten temperature of pure aluminum is just a few degrees higher than this. Since the only requirement for the formation of the iron-aluminum compound is the presence of these two materials at a temperature of 655°C, it is apparent that aluminum-clad iron made by the so-called "hot-dip" method, in which an iron core material is passed through a bath of molten aluminum, must be characterized by the presence of the aluminum-iron alloy at the interface.

Modification Attempts

Attempts have been made to modify this characteristic in order to produce a more desirable product. It is possible to reduce the interfacial layer thickness by the addition of silicon to the aluminum. Dr. P. T. Stroup, of ALCOA's Research Laboratory, has supplied us with the information shown in Fig. 10. This shows the reduction of interfacial layer thickness which is possible by the addition of relatively small percentages of silicon to the aluminum. Several modifications of the manufacturing technique for hot-dip aluminum-clad materials have been worked out in which the effects of this interfacial layer are minimized from the standpoint of material stiffness. Common practice, for instance, is to place a fairly heavy cladding on a core material which is much thicker than the material desired as the end product and then to roll the thick aluminum-clad strip down to the desired size. This tends to reduce the interfacial layer thickness; and, in

one method recently patented, sufficient reduction is made to actually fracture the interfacial layer and roll its broken pieces into random orientation in order to obtain a material having good forming characteristics. However, even though the interfacial layer thickness may be reduced by the use of these methods, we have found that high-speed parts fabrication requires that the compound be missing entirely if satisfactory production is to be obtained. Fig. 11 shows a specimen of hot-dip material which has been rolled down and stress relieved. Notice that the interfacial layer is present although some fracturing has occurred. Fig. 12 shows a hot-dip material which has been annealed. Measurements of ductility and springback indicate that this material is somewhat more satisfactory for the fabrication of parts than is the material of the first type. Fig. 13 shows a photomicrograph of another specimen which has been clad by the hot-dip method and has been annealed in order to obtain a soft core material. In this case all of the aluminum has alloyed with the iron, and the material is consequently very stiff and abrasive even though the core material has been stress relieved and the iron has recrystallized. These materials represent a reasonable cross-section of the various materials worked out during the initial stages of the investigation work which took place from three to five years ago. One of these materials was actually used by an American tube manufacturer for a number of years and may still be available commercially.

When this work was done, it was our belief that the materials available were unsatisfactory for high-speed precision parts production. Consequently, work was continued to develop a material which would overcome the difficulties of the aluminum-clad strip available at this time. Fig. 14 shows a photomicrograph of a material which we made at the G-E Research Laboratory using an electrolytic iron core material and a 2S aluminum sheet, following the

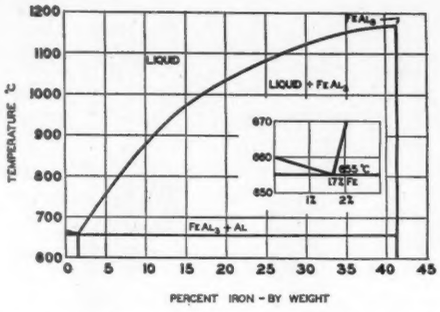


Fig. 9: Aluminum-iron constitution diagram

German method of bonding the sheets together by cold rolling. As you can see, this sheet is completely free of interfacial compound even after the annealing operation at 550°C. The material is obtained by passing through a rolling mill a sandwich of two sheets of aluminum from which the oxide film has been removed and a sheet of iron which has been cleaned. By adjusting the pressure in the first roll, sufficiently high pressure can be obtained to effect a molecular bond between the sheets without causing the temperature to rise to the formation temperature of the interfacial layer. Fig. 15 shows a photomicrograph of German P-2 metal, which consists of an oxygen-containing iron core material and a silicon-containing aluminum cladding material. This strip is, of course, made by the cold rolling method and, as can be seen quite thoroughly annealed. Notice that the cladding layer is thicker on one side than it is on the other. This is a result of a brushing operation used by the manufacturer to remove from one side of the material the heavy aluminum oxide film which forms during the annealing operation. More will be mentioned about this point later. Fig. 16 shows the detail of the interface magnified 750 times. There is no trace of the interfacial compound in evidence even at this large magnification.

Mechanical Characteristics

The mechanical characteristics of the cold rolled material are approximately the same as those of nickel-plated cold rolled steel which is in common use in the vacuum tube industry. There is considerably less springback with the cold rolled aluminum-clad materials, and the ductility for deep drawing is about the same as that of nickel-plated cold-rolled steel.

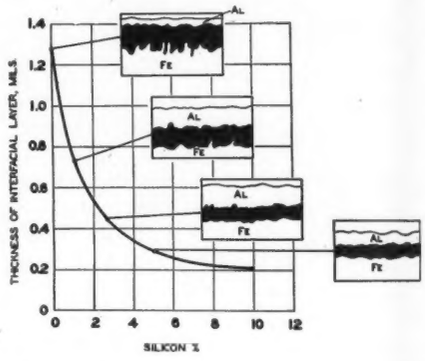


Fig. 10: Effect of silicon on the formation of iron-aluminum interfacial layer

Considering radiation capabilities, the aluminum-clad material is a very satisfactory substitute for carbonized nickel. After proper processing, aluminum-clad iron has a radiation coefficient of approximately 80% of a black body. A comparison between parts made from aluminum-clad iron and standard parts used in

Fig. 11: (Left) Specimen of hot-dip material that has been rolled down and stress relieved. Interfacial layer is still present
Fig. 12: (Center) Measurements show this hot-dip material, annealed, as being more satisfactory for parts fabrication
Fig: 13: (Right) Photomicrograph of another specimen clad by the hot-dip method and annealed to obtain a soft core material

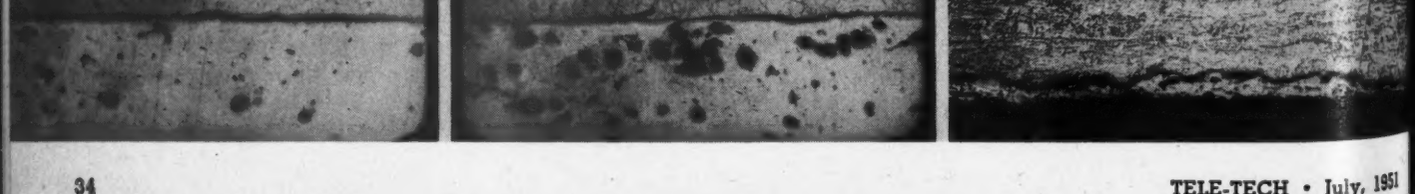


Fig. 14: Material made at GE Research Laboratory using electrolytic iron core and 2S aluminum sheet, bonded by cold rolling
Fig. 15: Photomicrograph of German P-2 metal consisting of iron core material with oxygen and aluminum cladding with silicon
Fig. 16: Detail of interface magnified 750 times. No trace of interfacial compound is in evidence even at this magnification

vacuum tubes prior to the introduction of this new material is shown on the preceding page. The processed parts give some indication of the darkening which occurs during the normal exhaust procedure when the part temperature is taken above the 655°C point. This darkening is a rather spectacular thing to watch because the part goes from silvery red to a dull blue-grey at some lower temperature due to the increased radiation efficiency obtained from the converted surface. As can be seen from the picture, the material is very rough and dark. The formed parts

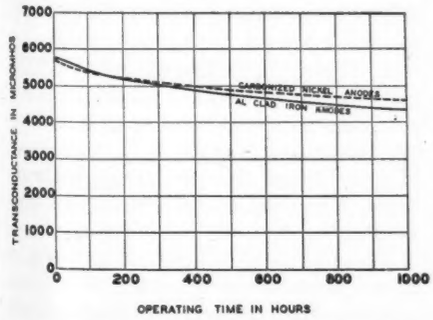


Fig. 17: Comparison between carbonized nickel and aluminum clad anodes. (12AT7 transconductance vs. operating time)

demonstrate that the material can be drawn and shaped as well as the carbonized nickel or nickel-plated steel parts for which it is substituted. In normal use, the parts are merely degreased prior to use. In cases where the formed piece has metal parts folded back on themselves or stitched together, as in the radiator of the 12AT7 plate and the mounting rib of the 5Y3-GT, it is sometimes desirable to use a more complete degreasing schedule than the normal trichlorethylene vapor affords in order to remove all die lubricants from the enclosed surfaces. In use, the brushed side of the aluminum-clad material is placed on the outside of the part. This side darkens more readily and more uniformly than the unbrushed side and consequently has a slightly better radiation characteristic. In addition, we believe that the evaporation of aluminum from the unbrushed side is somewhat retarded by the thicker layer of aluminum oxide which exists on that surface as a result of the manufacturing technique employed. Consequently, when the unbrushed side is toward the oxide-coated cathode, there is less danger of evaporating a layer of aluminum onto the cathode than if the material were reversed. Undoubtedly there is some evaporation from the aluminum-clad parts if the temperature is taken above the liquidus point prior to conversion of the Al to the $FeAl_3$. We can expect the evaporation rate to be a function of both temperature and time since, as the reaction between the aluminum and iron continues, the amount of unalloyed aluminum decreases and finally only interfacial compound is available on the surface. The juggling of these factors, combined with the apparent ability of aluminum to act as an "activating" material for the oxide cathode, presents some rather interesting possibilities as far as cathode emission and tube life characteristics are concerned. Fig. 17 shows a life test comparison between the transconductance of tubes made with aluminum-clad iron and carbonized-nickel anodes. Actually the curve is somewhat misleading in that the tubes are not identical in construction. It was found that considerable increase in emission level was realized when aluminum-clad iron plates were substituted for carbonized-nickel plates in this type. As a result, it became desirable to modify the grid-to-cathode spacing of the tube in order to bring transconductance values into line with specifications for the type. This change alone was sufficient to bring about a considerable reduction in mounting loss strictly as a secondary effect of the substitution of the aluminum-clad material.

Outgassing Complete

Our observations indicate that the aluminum-clad material can be more completely outgassed more rapidly than can other types of material such as carbonized nickel or nickel-plated steel, and as a result cathodes are activated under higher vacuum conditions on exhaust equipment. In addition, the evolution of gas from anode surfaces during life seems to be reduced. To date we have been successful in producing laboratory samples of the cold-rolled material in our own laboratories, and we are currently conducting a cooperative effort with our laboratories, manufacturing groups, and suppliers to develop a reliable source of cold-rolled aluminum-clad material in this country. It is hoped that through the application of this material the seriousness of the nickel shortage in the electronics industry may be reduced to a degree and that eventually the material will prove even more advantageous on the basis of an improved performance to cost ratio.

Since this work has been conducted over a number of years, it would be impossible to mention here all those who made significant contributions to our knowledge. However, mention should be made of those whose efforts were particularly outstanding. They are: C. W. Conklin and J. C. Hickle, of the Special Development Group in Owensboro, Ky.; F. C. Kelley, of the Research Laboratory at Schenectady; and L. U. Hamvas, of the Advanced Development Group at Schenectady.

1. Aluminum-Clad Iron Wire for Electron Tubes, W. Espe & E. B. Steinberg, TELE-TECH, Feb. 1951, p. 28, 29, 30, 72.

Shock Testing of Airborne

Characteristic features of shock as experienced of measuring shock severity discussed and typical

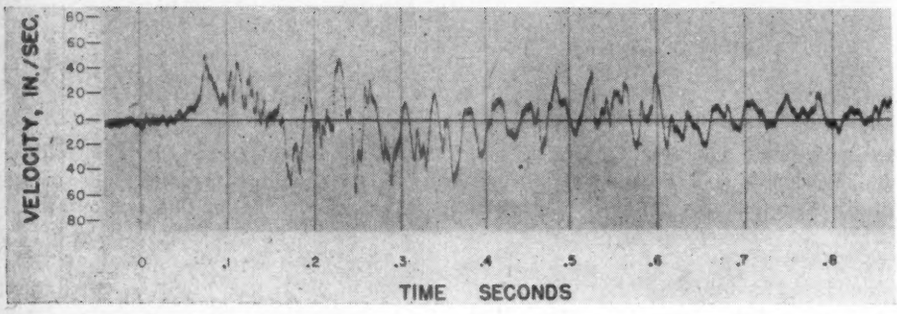


Fig. 1: Shock motion measured on an airborne radar antenna during hard landing

By CHARLES E. CREDE, Chief Engineer, The Barry Corporation, 700 Pleasant St., Watertown 72, Mass.

A SHOCK motion may be defined by the displacement, the velocity, or the acceleration of a part of the aircraft structure, expressed as a function of time. It can be adequately measured only by recording the time history of these physical parameters. Theoretically, any one of these parameters may be derived from any one of the others. For steady state vibration, well-known formulae are readily available for making this conversion. For example, $v = x\omega$ and $a = x\omega^2$, where v and a are maximum values of velocity and acceleration, respectively, of sinusoidal motion whose displacement amplitude is x and whose circular frequency is ω.

For shock motions which are transient in nature, the conversion is basically simple but actually very laborious. To convert from displacement to velocity, for example, the slope of the displacement-time record must be measured at each point for which the velocity is required ($v = dx/dt$). Acceleration is obtained, by a similar process, from the slope of the velocity record ($a = dv/dt = d^2x/dt^2$). To obtain displacement from velocity or acceleration, the time history of the basic record must be integrated, starting from a known reference ($v = \int a dt$, $s = \int v dt = \int\int a dt dt$).

Typical shock motions are illustrated in Figs. 1 and 2. Fig. 1 is a velocity-time diagram which illustrates the shock motion, measured on a radar antenna installed in an aircraft, during a hard landing. A velocity-time diagram of the motion experienced by a structural member of a Naval vessel, as a result of a nearby underwater explosion, is shown in Fig. 2. The irregular pattern of these shock motions should be noted. It may be shown that they are comprised of many harmonic components, each with its characteristic frequency, amplitude and damping coefficient, combined in random phase relations. It is difficult if not impossible to define a shock motion by simple coefficients or by tables of numerical quantities.

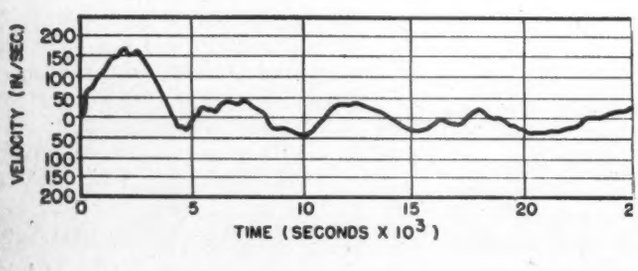
Response to Shock Motion

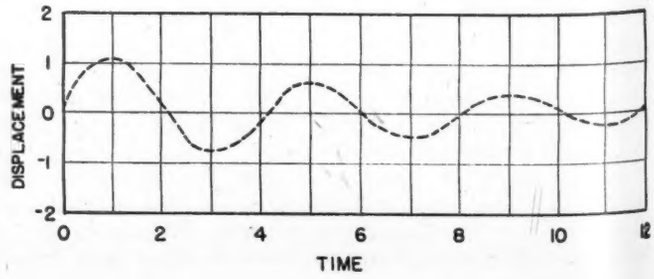
To the designer of airborne electronic equipment, data of the type given by Figs. 1 and 2 are of little more than academic interest without further analysis. The principal question is: What damage is likely to be sustained by the equipment that is subjected to these shock motions? To investigate this problem, using the actual equipment and the complete shock motions illustrated in Figs. 1 and 2, involves a much more complex analysis than the results justify. The work can be greatly simplified, and much significant information obtained, by idealizing both the shock motion and the equipment. The damped sinusoidal displacement record at a single frequency, shown in Fig. 3, may be taken as the idealized shock motion; and the massless beam carrying a concentrated, rigid load at the center, shown in Fig. 4, may be considered to simulate any structural element of the actual equipment.

For purposes of definition, Fig. 4 shows a massless beam which carries a concentrated load; the beam is attached to a support whose displacement is described as a function of time by the curve shown in Figure 3. The structure shown in Fig. 4 may be considered capable of withstanding a given shock if the maximum stress in the beam never exceeds the

Fig. 2: (Left) Shock motion measured on a Naval vessel as a result of a non-contact, underwater explosion

Fig. 3: (Right) Idealized shock motion, used to investigate response of beam loaded system shown in Fig. 4





Electronic Equipment

PART ONE
OF TWO PARTS

in various military applications illustrated. Means testing machines are described and illustrated

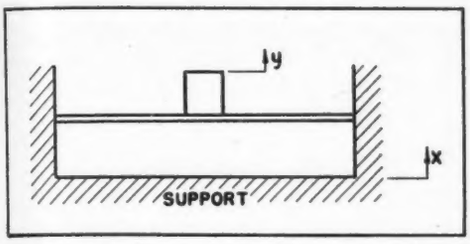


Fig. 4: (Left) Simple structure consisting of massless beam carrying a rigid, concentrated load

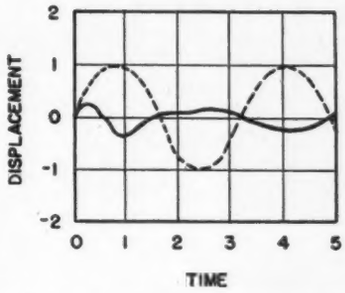


Fig. 5: (Center) Relative motion *x-y* (solid line) between load and support in Fig. 4 when support experiences sinusoidal motion *x* (dotted line). Natural frequency is 2.5 times as great as the frequency associated with the motion of support

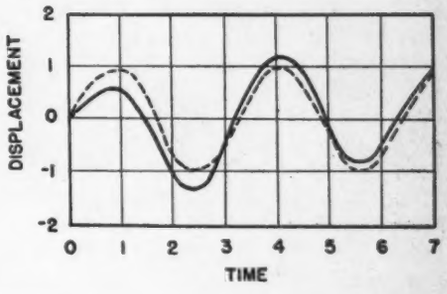


Fig. 6: (Right) Relative motion *x-y* (solid line) between load and support in Fig. 4 when support experiences sinusoidal motion *x* (dotted line). Natural frequency of beam-load is 40% as great as frequency associated with motion of support

maximum allowable stress. Since the beam is assumed massless its maximum stress is directly proportional at all times to the relative displacement (x-y) of the load from its position of static equilibrium; the maximum stress is also directly proportional to the acceleration (d^2y/dt^2) of the load.

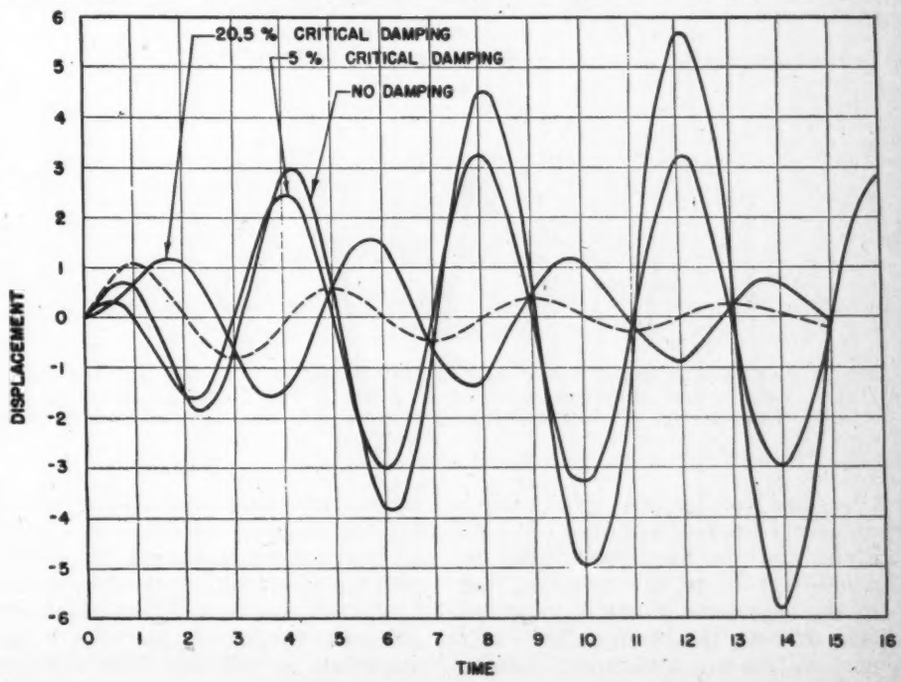
Motion of the Load

The motion of the load (y in Fig. 4) is a function of the properties of the beam-load system, and of the characteristics of the shock motion experienced by the support. The natural frequency of the beam-load system, relative to the frequency associated with the shock motion, is of particular significance. If the beam is relatively stiff, the load tends to follow the motion x of the support; i.e., the relative motion between the load and the support is small. This is illustrated in Fig. 5, wherein the natural frequency of the beam-load system is two-and-one-half times the frequency of the vibration embodied in the motion of the support. The displacement of the support is indicated by the dotted line, and the relative displacement between the load and the support is shown by the solid line. Since the load experiences substantially the same motion as the support, it also tends to have approximately the same maximum acceleration.

If the beam lacks stiffness, its natural frequency is relatively low and the load tends to remain almost stationary in space. The relative displacement between the load and the support then becomes approximately equal to the displacement of the support. This is indicated in Fig. 6, for a beam-load system whose natural frequency is 40% of the frequency embodied in the motion of the support. The absolute motion of the load is small relative to the motion of the support, and its maximum acceleration is small compared with the maximum acceleration of the support.

If the natural frequency of the beam-load system is nearly equal to the frequency of vibration of the support, the relative displacement *x-y* between the load and the support may become very large. For steady-state vibration, it is well known that the vibration amplitude is sometimes great under such resonant conditions, depending on the degree of damping in the beam. For the transient conditions being considered

Fig. 7: Relative motion *x-y* (solid line) between load and support in Fig. 4 when support experiences motion (dotted line) Natural frequency of beam-load system coincides with frequency associated with motion of support Relative motion curves are included for beam-load systems having 0.5.0, and 20.5% of critical damping



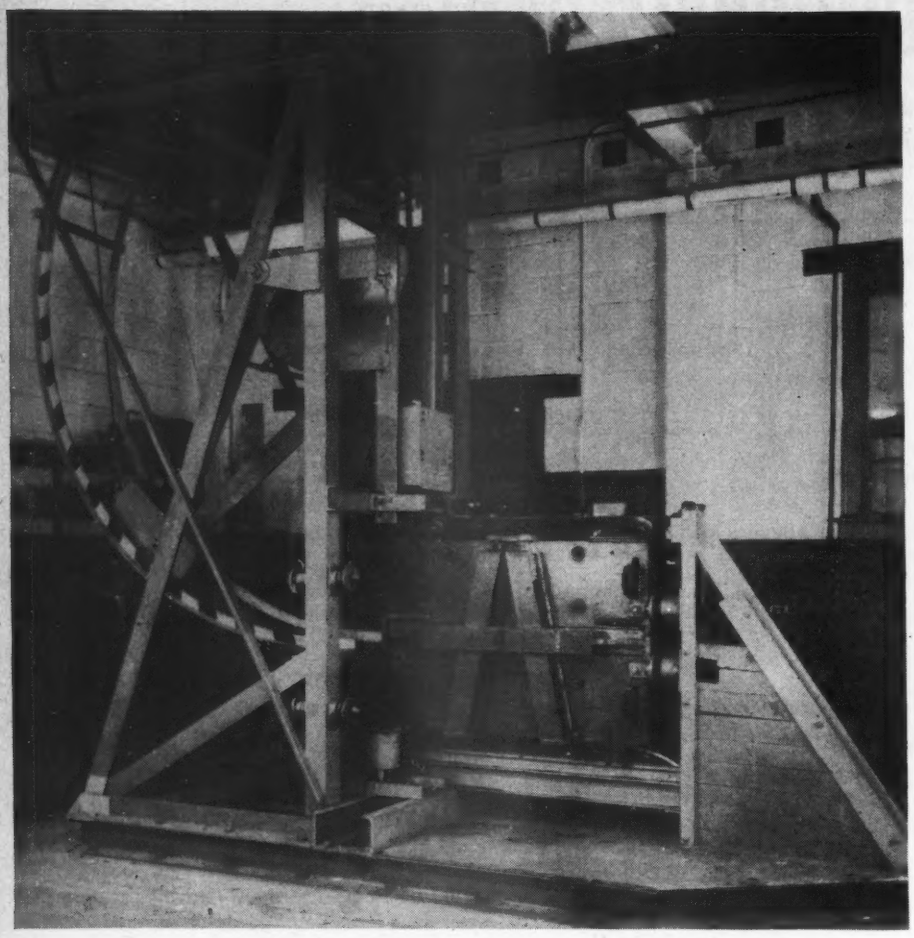


Fig. 8: High impact shock testing machine for light weight equipment

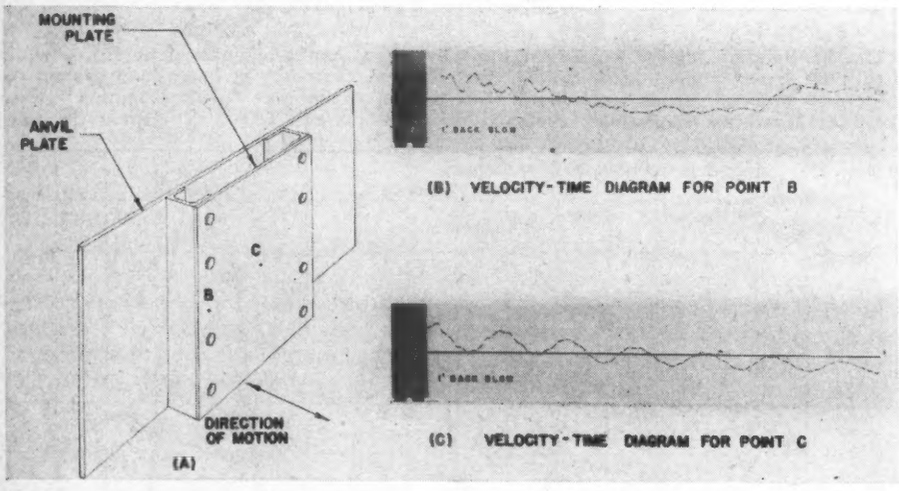


Fig. 9: Anvil and mounting plates used on High Impact shock testing machine shown at (A) Velocity-time diagrams obtained at points B and C are illustrated at (B) and (C) respectively. These result from a 1 ft. hammer drop applied to anvil plate

here, the load tends to experience a greater vibration amplitude at each cycle, and its maximum value depends largely on the damping both in the beam and in the support motion. If both the beam and the support motion are undamped, the amplitude increases continuously to an infinite value at infinite time. If the support motion is damped, its amplitude decreases with each cycle, thereby introducing a condition which opposes the continuing increase in the amplitude of the load. The relative displacement between the support and the load consequently reaches a maximum after a finite number of cycles, and thereafter decreases. Fig. 7 shows the relative displacement as a function of time for the initial several cycles of vibration, when the natural frequency of the beam-load system is equal to the frequency associated with motion of the support. Curves are included for an undamped beam, and for beams with 5 and 20.5% of critical damping; damping of the support motion is 8.6% of critical.

Maximum Acceleration

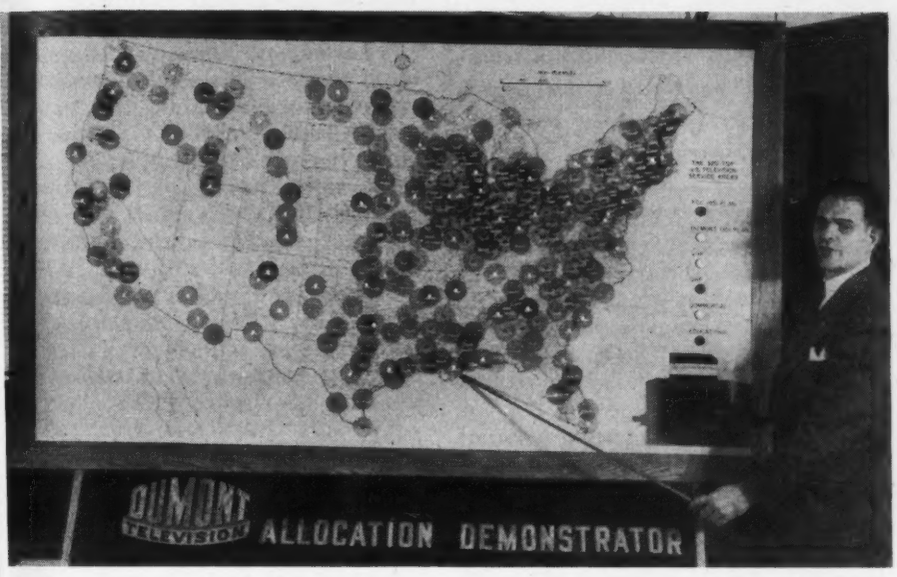
It is illustrated by the idealized examples set forth in Figs. 5 to 7 that the maximum acceleration of the load carried by the beam may be equal to, less than, or greater than the maximum acceleration experienced by the support. The maximum acceleration of the support is thus not an unqualified indication of the severity of the shock. The necessary qualifications are best illustrated by investigating the results obtained from shock tests on several well-known types of shock testing machines. The High Impact Shock Testing Machine for Light Weight Equipment, used for testing Naval shipboard equipment, is shown in Fig. 8. It employs a heavy hammer adapted to strike an anvil plate, which suddenly acquires a relatively great velocity in response to the force applied impulsively by the hammer. The motion of the plate is arrested after it has traveled approximately 1½ in. A mounting plate is attached to the anvil plate, as shown in Fig. 9(A), and the equipment undergoing test is attached to the mounting plate. The impulsively applied force causes both anvil and mounting plates to be set into vibratory motion at their respective natural frequencies, their vibratory motions being superposed upon their over-all motions.

The extent to which the vibratory motion of the mounting plate is transmitted to the equipment under test depends upon the location of the equipment on the plate. Velocity-time diagrams of the shock motions, as measured at the edge B and center *C* of the mounting plate, are shown in Figs. 9 (B) and (C), respectively. The motions illustrated exhibit the damped sinusoidal characteristics shown in Fig. 3; the beam-load system should therefore respond somewhat in accordance with the illustrations of Figs. 5 to 7. The response may be evaluated by noting the maximum acceleration of the load

(*Continued on page* 66)

Du Mont Television Allocation Plan

FCC's allocations are compared with alternative Du Mont proposals; plan is most ambitious of any offered by respondents' suggested allocations



Dr. T. T. Goldsmith, Jr., demonstrating the Du Mont illuminated allocations chart by means of which it is possible to show the effects of various allocations plans.

By JOHN H. BATTISON,
Associate Editor

NOW that the industry has had time to grasp the full implications of the Commission's proposed TV allocation plan, many voices are being raised in praise and condemnation of it. Loudest and most effective of the latter is that of Dr. Allen B. DuMont who has proposed a completely revised allocation table which not only supersedes that of the FCC, but does a more efficient job of distributing the much-wanted VHF frequencies, and makes it possible for more major cities to be assigned four or more channels.

So great has been the volume of correspondence received by the FCC in connection with the proposed plan that the date for commencing the final city by city hearing has been postponed twice; the latest date is July 9th. Most of the comments merely refer to the particular city or cities, served by the commentator, and either agree with the allocation or propose some minor change. Dr. DuMont's is the only organization which has put energy and time and money into the preparation of a complete plan designed for the industry as a whole. For that reason the major points of the plan are given below.

Dr. DuMont has prepared sample allocations for those states north and east of Memphis, Tenn. However, this is more than adequate to show the scope of his proposal. Tabulated herein is a comparison between the FCC's plan and Dr. DuMont's for New York State. This gives a good example of the improvement to be found in the assignment of VHF channels to major cities.

The basic position which DuMont takes in regard to the FCC Allocation plan is that it provides generally sound engineering, is not as efficient as it should be in utilization of the available spectrum space, and will foster network and market monopolies. The proposed alternative allocation based on the same engineering data as the FCC plan increases in efficiency with increases in population density.

The major points of comparison with the FCC's plan are:

(1) Provisions for more television stations in more communities.

(2) 655 VHF assignments in 375 communities, as compared with FCC's 557 assignments in 342 communities (an increase of 98 VHF stations, or 17.5%, and an increase of 33 communities served by VHF, or 9.6%);

(3) In the top 100 population cen-

(*Continued on page* 64)

FCC AND DU MONT CHANNEL ALLOCATIONS FOR NEW YORK

NEW YORK STATE	FCC Channel Allocations VHF	FCC Channel Allocations UHF	Du Mont Allocations VHF	Du Mont Allocations UHF
Albany-Schenectady-Troy	6	17*,23	3,6,10	29
Amsterdam	—	52	—	55
Auburn	—	37	—	31
Batavia	—	33	—	65
Binghamton	12	40,46*	12	14,24,45,56
Buffalo	4,7	17,23*	4,7,11,13	33,63
Cortland	—	56	—	51
Dunkirk	—	46	—	38
Elmira	—	18,24	—	40,53
Glens Falls	—	39	—	19
Gloversville	—	29	—	21
Hornell	—	50	—	37
Ithaca	—	14*,20	—	62,64
Jamestown	—	58	—	54
Malone	—	20	—	58
Massena	—	14	—	62
Middletown	—	60	—	16
New York	2,4,5,7,9,11	19,25*,31	2,4,5,7,9,11,13	19,62
Niagara Falls	2	—	—	21
Ogdensburg	—	24	—	42
Olean	—	54	—	16
Oneonta	—	48	—	26
Oswego	—	31	—	41
Plattsburg	—	28	—	15
Poughkeepsie	—	21	—	35
Rochester	5,10	15,21*,27	3,6,10	34,55,61
Rome (see Utica)				
Saranac Lake	—	18	—	17
Schenectady (see Albany)				
Syracuse	3,8	43*	5,8	15,18,20
Troy (see Albany)				
Utica-Rome	13	19,25*	2,4,11,13	43,59
Watertown	—	35	—	38

* Educational Channels

CUES for BROADCASTERS

Practical ways of improving station operation and efficiency

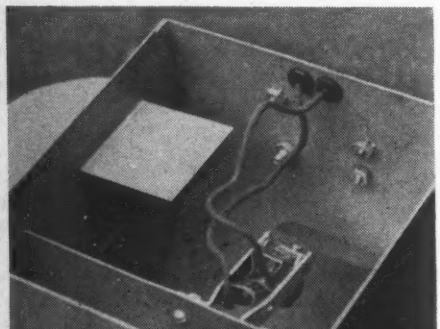
Edited by John H. Battison

Air Failure Protection

WILLIAM MARON, Chief Engineer, WPOE, Elizabeth 4, N. J.

THE 7C24 power tube used in many RCA FM transmitters needs a copious supply of air to prevent the tube from failing. A minimum air flow of 275 cfm through the radiator, and 10 cfm directed at the header, is required.

There is a centrifugal switch on the blower motor(s), which is interlocked with the plate supply, to remove high voltage if the motor should cease operating. However, there is no protection against the fan loosening on the motor shaft or the filter becoming clogged or failure of the air supply for any other reason.



Pressure vane in air duct of transmitter

Recently we lost a 7C24 ($159.50) because the filter choked up and reduced the air flow below the necessary minimum requirement. This caused the tube to overheat, softened the filament seals, and resulted in an intermittent grid to filament short. Therefore it was decided to install an air switch in the exhaust duct of the blower.

This device is simply a small mercury switch, mounted between two angle brackets, which are in turn bolted to the exhaust duct. The switch is arranged to swivel freely between the brackets. A small vane, cut from stiff sheet brass, is fastened to the clamp holding the mercury switch. A two-terminal barrier-type terminal strip permits easy disconnection of the wires so the blower may be removed for servicing.

The contacts are wired in series with the high voltage interlock circuit. The weight of the vane, with no air flowing, causes the switch to tip so as to make the mercury flow away from the contacts. Movement of air raises the vane, closing the switch and permitting application of high voltage.

The size of the vane is adjusted by trimming so that a small reduction in the amount of air will cause the vane to drop and remove the plate voltage.

$$$ FOR YOUR IDEAS

Readers are invited to contribute their own suggestions which should be short and include photographs or rough sketches. Typewritten, double-spaced text is preferred. Our usual rates will be paid for material used.

Continuous Delay with Two Tape Recorders

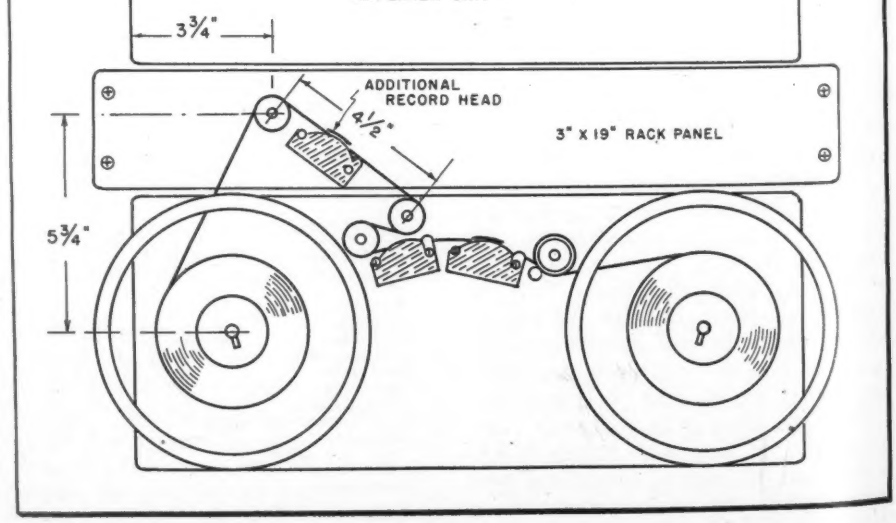
DAVID S. FOLEY, Chief Engineer, KRKO, Everett, Washington

STATIONS in outlying regions not adopting daylight saving time are forced to delay all network programs one hour in order that programs may be heard at regular time. This is no problem to larger stations, but to the small station on a small budget, the cost of adequate recording equipment is almost prohibitive. KRKO has solved this problem with a minimum of cost. The existing recording equipment consisted of two Magnecorders and one Eko tape, and the recording schedule was such that it required the use of four machines to provide continuous delay. To eliminate this disadvantage, an additional play head was installed on each Magnecorder in advance of the erase-record head; thus one machine serves two functions. This combination has been put through every conceivable test and has worked well.

The idler was made from miscellaneous hardware, available at most radio stations, and is made from a small *Fafnir* roller bearing (designed for electric motors) mounted on a volume control feed-through bushing. Small aluminum guards were mounted to provide proper tape tracking. Wow and flutter are not objectionable, and could probably be further reduced with a second idler, mounted in much the same manner as on the Magnecorder.

At KRKO the outputs of the heads are fed directly to a console mike input with equalization of 5 db bass boost per octave beginning at 1300 cps provided in the preamp. No problems with hum were encountered and

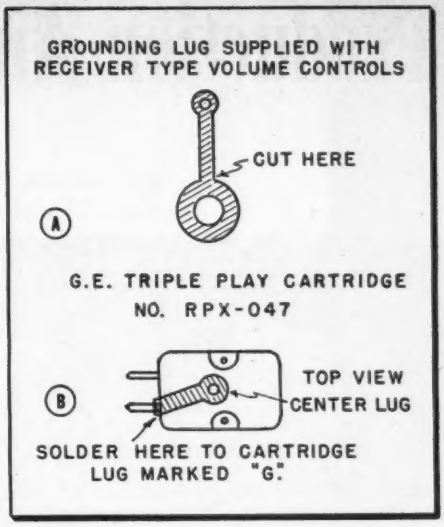
Mechanical layout of additional recording head for providing delayed recordings



with proper equalization, frequency response is comparable to the regular Magnecorder unit on play position.

In operation the machines are run at 7½-in. second and the first hour is recorded in normal fashion. During the second half hour period, tape number one is cued to within 5 seconds (about 3 ft.) of the auxiliary play head. The unit is placed on record, and at :59:55 or :29:55 as the case may be, the tape is started rolling. The program to be played will commence, be erased, and the next program will be recorded on the tape. It has been found that operator error is reduced considerably. If a program is being aired, the next program will most certainly be recorded.

Tape breakage would of course result in time lost on two programs instead of one, but by using tapes with no splices and in good condition, no problem has arisen on this score.



Details of grounding lug for G.E. pickup

Stylus Static Grounded

HENRY R. KAISER, Chief Engineer, WWSW, Pittsburgh, Pa.

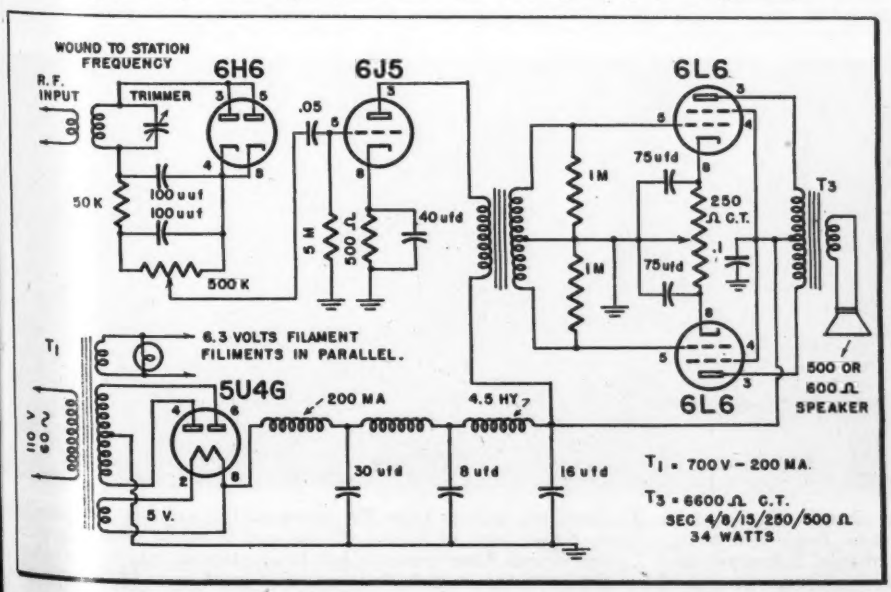
AT various times since installing the GE triple-play pickup cartridge (GE PPX-047) clicks and pops have been observed while playing certain records and transcriptions. At first, these noises were believed to be imperfections in the grooves, but after repeated playings of the offending discs, it became apparent that the clicks or pops were not cyclic, but of a random nature. It was also determined that on some days these strange noises were practically non-existent and at other times, they were serious enough to give the V U meter a healthy kick. These two symptoms led to the conclusion that a static discharge was the cause of the trouble.

In tracking down the point at which the static discharge was taking place, it was found that there was no continuity between the stylus assembly and any other part of the cartridge or ground. This condition apparently permitted the static voltage from the disc to jump between the stylus assembly and the nearest grounded conductor. This discharge in turn either induced a voltage directly, into the pickup coil or indirectly by creating a mechanical shock on the stylus assembly.

To place the stylus assembly at ground potential, a grounding lug of the type which is supplied with receiver type volume controls was used. This lug was modified by cutting and bending, after which it was fastened. It was not necessary to ream the hole in the lug.

Since installing the stylus assembly ground lug, we no longer hear what sounded like buttons popping in the middle of the Robert Hall commercial!

High-fidelity recording off-air monitor for feeding multiple loudspeakers



Automatic Recording Timer

JOSEPH G. MUENCH, Chief Engineer, KPKW, Pasco, Wash.

AS a network station, KPKW is required at times, to tape a considerable amount of programs for later release. The problem, therefore, was remembering to turn on the machine for taping at certain and varied times in each day and week. An electric clock was obtained which has a 110 volts ac outlet on the back and which is controlled by pre-set positions on the face of the clock.

Several models of this type of clock are put out by such firms as General Electric, Telechron, etc. KPKW uses a G.E., which has a total of 48 positions, one for each quarter-hour for the full twelve hours. Red lamps were installed in the control room and in the office, with winker or flasher buttons in the sockets. These in turn are fed by the ac outlet on the back of the clock. This system enables each man to pre-set the clock for each program which is to be taped on his shift. The timer clock is set with the station clock in order to give approximately, a two-minute leeway ahead of the starting time. The flasher buttons used take about forty-five seconds to fire the first time for each period, so this must be taken into consideration when the clock is initially set.

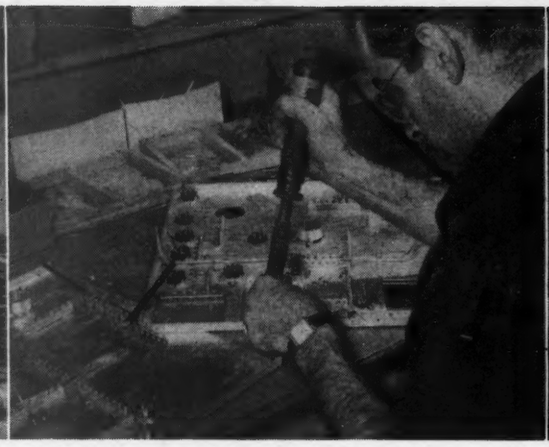
Off the Air Monitor

FRANCIS J. BOCK, Chief Engineer, WJVA, Mishawaka, Ind.

EVERY radio station has its own monitor built into the console but at WJVA it was found advisable to have an "off the air monitor" because the trasmitter and control board are in the same room. The engineer on duty is able at all times to hear the station as it is performing on the air. The monitor uses about six feet of antenna in the control room to pick up r-f from the transmitter, which is rectified and amplified. If the monitor becomes inaudible he knows the transmitter is off the air or that some other part of the equipment has failed. The monitor also handles up to five speakers by an output transformer which has a variable impedance.

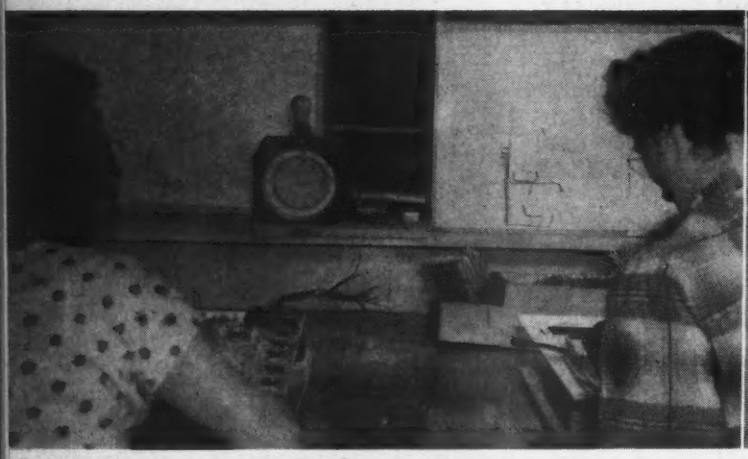
Production Aids in Television

1 Start of main chassis assembly. Here operator solders grounding straps from tube sockets and terminal strips to metal base. Timer and flasher in background are to control production rate



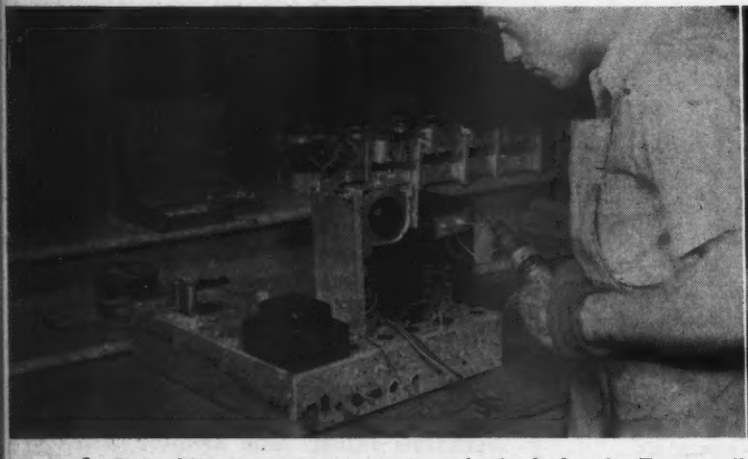
2 Addition of as many components as possible is accomplished with chassis lying flat and bottom side up. Absence of chassis aprons at this point greatly facilitates handling

3 Mounting of power transformer calls for introduction of a simple wood jig. This jig holds chassis through all wiring operations until sides are added



4 Start of wiring operations. Chart directly in front of each operator shows physically by size and color different wires to be installed. Timer and flasher readjust production timing

5 Self-tapping metal screws attach four chassis aprons. Since only front and rear panels involve circuitry, other two metal panels can be replaced with non-critical material



6 Assembling components on top of wired chassis. Focus coil and deflection yoke plug into main chassis. Note that high voltage cage acts as support frame for elements. Dummy plug near tuner keeps miniature tube socket contacts straight

7 Installing indoor type TV antennas in cabinets. Antenna is a modified form of folded dipole and is made from aluminized cardboard. After antenna has been stapled into top of cabinet, the receiver is installed and unit is then ready for packing

Receiver Manufacture

Integrated electrical and mechanical design provides for efficient output

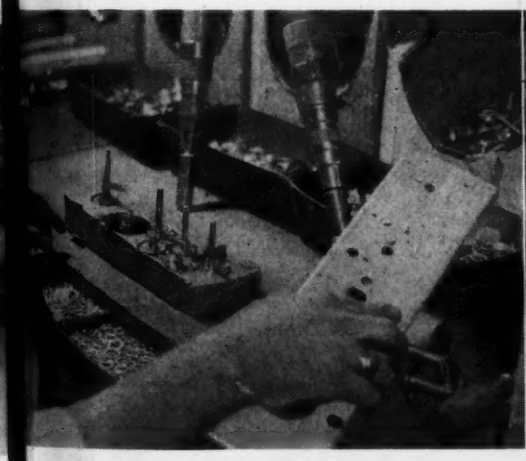
By ***BERNARD F. OSBAHR,*** *Associate Editor*

THE photographs on these pages show a few of the many interesting manufacturing techniques employed at the plant of Majestic Radio and Television, Division of The Wilcox-Gay Corp., located at 70 Washington St., Brooklyn, N. Y. Some of these ideas were developed as a means for reducing fabricating costs, while others are the inventions of necessity. The overall design and construction of the TV receiver, in addition to the electronic considerations, is based on making maximum use of available space facilities while minimizing any limitations such facilities may impose.

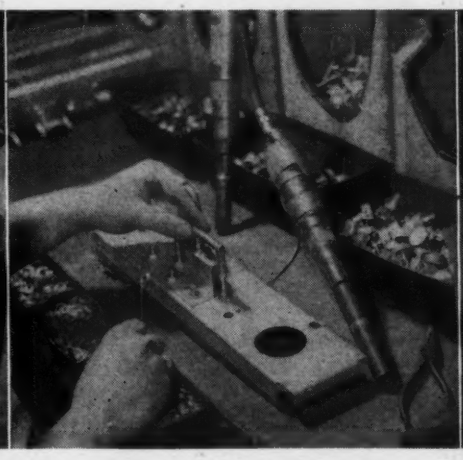
In all, there are approximately 100,000 sq. ft. of working area in this plant about equally divided between two floors in the building. Some 15% of this space is devoted to sub-base manufacturing operations where the main receiver chassis and the four chassis

(*Continued on page* 83)

Making high voltage and resistance check on finished chassis



8 Start of front panel subassembly. Controls are held in position by "home-made" cast lead block. Panel is simply dropped over controls



9 After airgun has tightened control lockwashers and nuts to panel, switch subassembly is added. Note jig to steady control shafts

10 View of completed chassis apron subassemblies. Note wood jigs for holding panels to facilitate wiring. Rear apron is in foreground

11 Another simple lead block exactly positions the corona ring for the high voltage tube socket subassembly, thus facilitating soldering

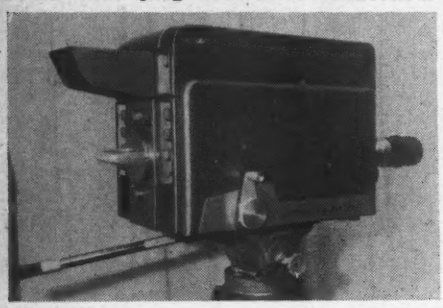
12 Device used to twist wire leads. Large Mueller type battery clip, driven by geared down motor, clamps onto plug to twist lead

13 Two methods for soldering shielded wire: flat cable hinged lead weights, front, hold leads in place; staples and spring clips are guides, rear

New Equipment and Components

Studio Camera Channel

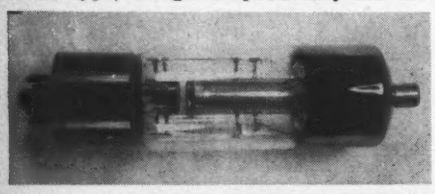
A new television studio camera channel has been completely pre-wired and fitted with plug and cable connection.



The new channel (type PE-8-B) features a camera light in weight, extremely accessible, and mountable on any standard tripod or dolly. A new I.O. yoke assembly mounted on ball bearing slides with plug-in connections provides smooth focusing and ready accessibility. Damage to the I.O. tube in the event of sweep failure is prevented by a sweep protection circuit. A sweep expansion switch is provided for oversweeping during rehearsal. The camera has a four lens turret, allowing wide selection of lenses. Other features of the new channel include dual waveform presentation, eight kilovolt viewfinder, 12½ in. picture monitor, and virtual elimination of heat and microphonics from the control desk.—**Dept. N-2, General Electric Co., Electronics Park, Syracuse, N. Y.**—TELE-TECH

Triode

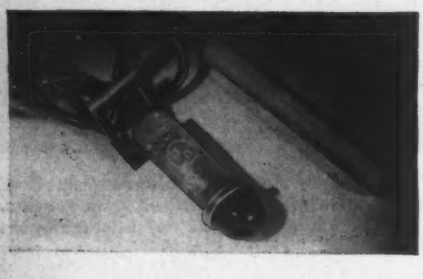
The MTL 2C175 is an ultra-high mu remote cut-off triode of the planer electrode type, designed specifically for use



as a high voltage regulator or voltage amplifier at plate potentials between 1 and 20 kv. Special features of this tube include low capacitances, excellent electrode alignment, remote cut-off, ruggedness, large gettering surface, and reliability. It can also be used in high voltage sweep circuits employing electrostatic deflection. Maximum ratings are: anode voltage, 20 kv; average plate current, 2 ma.; grid voltage, —200 volts; plate dissipation, 12 watts; heater cathode voltage, ±300 volts.—**Multi-Tron Laboratory, 5512 West Harrison St., Chicago 44, Ill.**—TELE-TECH

Pilot Light

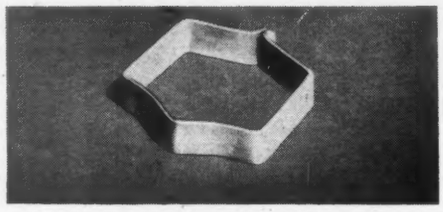
The Omni-Glow model 1010 is a neon light encased in a nylon tube which slips through the mounting panel and is held in place with a special speed nut supplied with the unit. The lens is available in a wide selection of colors suitable to neon and features Fresnel lens



for more even distribution of light. A polished metal collar connecting lens and body, provides attractive trim on the operating side of the panel. Operating on a 75 to 250 voltage range (ac or dc), it provides a pleasing, soft light with practically no heat. The neon light withstands vibration and shock, as well as voltage overloads, that would ruin the usual incandescent pilot light. Other models are available for various operating voltages and degrees of light intensity. The standard unit comes with 4½ in. leads, ½ in. stripped and tinned for easy electrical hookup. Other models are available with ring tongue terminals and special leads.—**Industrial Devices, Inc., Edgewater, N. J.**—TELE-TECH

Ion Trap

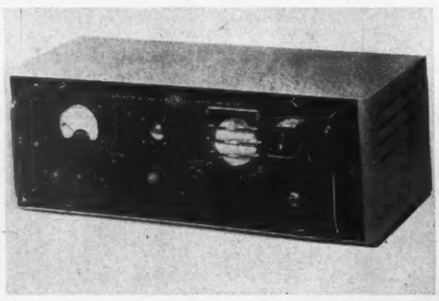
The "E-ZEE-ON" ion trap possesses a uniform field pattern and can be adjusted in a matter of seconds with one hand.



It's a slip-on, grip-snug beam bender made of one piece, permanently magnetized Cunife that can't be put on backward and requires no manual clamping. According to the manufacturer, the "E-ZEE-ON" provides a more uniform magnetic field pattern, resulting in brighter, more uniform definition easily attained by sliding the "E-ZEE-ON" forward or backward on the tube neck. Because of its uniform weight distribution, it will not jar loose or slip, nor come out of adjustment.—**The Indiana Steel Products Co., Valparaiso, Indiana**—TELE-TECH

Ionization Tester

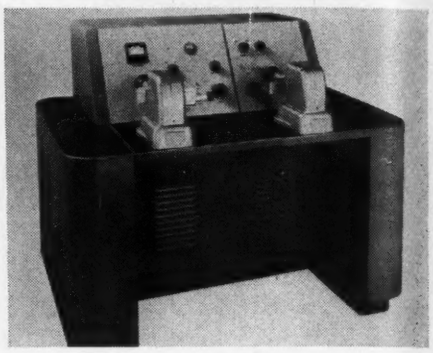
The Airmec 5 KV Ionization Tester (type 732) introduces a new non-destructive method of testing insulation where-



by the voltage at which components commence to ionize may be readily ascertained. A direct voltage continuously variable from 250 to 5000 volts is provided by a high impedance source, and this voltage is applied to the insulation of the component under test. The ionization currents which occur within the insulation when the voltage is raised beyond a certain value, are amplified and used to provide an audible indication by means of a loudspeaker. Thus the threshold voltage level at which ionization commences is immediately apparent and the test may be discontinued at any point before actual breakdown occurs. Leakage resistances of the order of 50 megohms and less are indicated visually by means of the opening of a magic eye, and the fall in reading of the voltmeter.—**British Electronic Group, 366 Madison Ave., New York 17, N. Y.**—TELE-TECH

TV Flying Spot Scanner

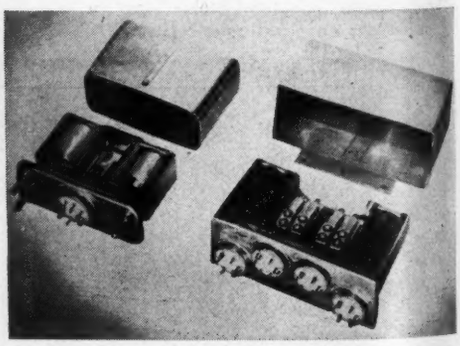
Console-mounted for smooth operation, a basic TV flying spot scanner unit (FTL-35A) has been designed to handle,



semi-automatically, from one to thirty-six 2 x 2 in. double-frame, 35 mm slides which may be shown in or out of sequence. An automatic signal cut-out blanks out the picture while the slide is in motion. It requires the services of only one technician instead of two and releases the far more expensive television pickup apparatus for other uses. By means of an economical "add-a-unit" feature, this equipment may also be employed as a dual scanner consisting of the single scanner plus an auxiliary unit. Designated as the FTL-82A, this unit may be used to obtain lap dissolves, fades and other flexible arrangements between two scanner units. Optionally, the auxiliary part of the dual unit may be used to achieve montage effects, either on the stills from the first scanner, or on a "live" program from a remote source. These effects cover all types of superposition, including the insertion of a sponsor's message in a live picture. Low initial and low operating cost, ready accessibility of all units, wide contrast range, and a very high horizontal resolution or definition (600 lines minimum) are cited as additional advantages.—**Federal Telecommunication Laboratories, Inc., Nutley, N. J.**—TELE-TECH

Sealed Multiple Relays

Especially developed for use in military airborne equipment, the "2-in-a-can" and "4-in-a-can" relays are thoroughly

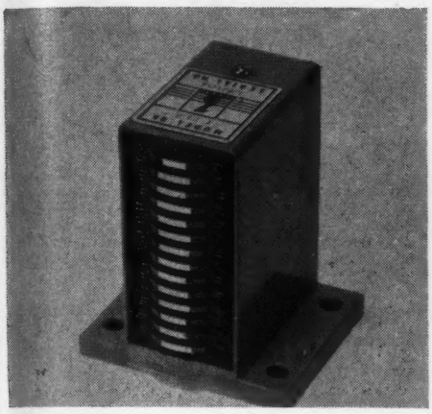


dessicated and hermetically sealed in inert gas. Protected from dust, fumes, climatic conditions and the human hazard of tampering, the hermetic seal promises an operational life of several times that of an unsealed relay. The 2-in-1 assembly carries four form C with two ampere palladium contacts on each relay. It has overall dimensions of 3 x 1⅛ x 2 in. high and weighs six ounces. The 4-in-1 assembly has four form C on each relay with five ampere silver contacts. It measures 3⅞ x 1½ x 2 in. high and weighs 13 ounces.—**Potter & Brumfield, Princeton, Ind.**—TELE-TECH

for Designers and Manufacturers

Record-Reproduce Head

A new multichannel magnetic record-reproduce head has been developed. Known as the BK-1500 series, it is avail-



able from 3 to 14 channels. Design features include balanced magnetic construction with gaps at front and rear. All gaps are in perfect alignment, and individual channels are cast into one integral block of specially selected synthetic resin. The complete assembly is nonmicrophonic and impervious to moisture. Shields and pole pieces are grounded to the housing. The head has a channel width of 0.050 in. with center-to-center spacing between channels of 0.125 in. The gap is 0.0005 in. Maximum output level at 1000 cps and 7.5 in. per second tape speed is 0.002 volts rms.—**The Brush Development Co., 3405 Perkins Ave., Cleveland 14, O.**—TELE-TECH

Magnetic Probe

A new type of magnetic probe which reads the magnitude and direction of the flux density in an air gap as small

as .025 in. thick and .01 sq. in. is now available. In addition, the flux value is obtained as a steady reading on a dc meter movement as long as the probe is held in the magnetic field. No jerk or pull or ballistic reading or circuit breaking is required. The probe is an excellent tool for plotting magnetic leakage fields, since it is entirely nonmagnetic and the field is not disturbed by the probe. This allows in six ranges an accuracy of 2½% from 10 gauss to 30,000 gauss for both ac and dc magnetic fields. Simple test jigs are readily adaptable for making production tests on magnetic materials with speed and accuracy.—**Dynn Labs, Inc., 132 Lafayette St., New York 13, N. Y.**—TELE-TECH

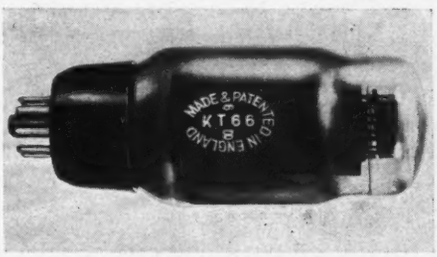
Resistors and Rheostats

A complete line of wire-wound resistors and rheostats are available meeting JAN specs. Offered in eleven models, each rheostat meets the requirements of specification JAN-R-22. These models include both standard and enclosed types, in sizes ranging from 25 to 750 watts. Of the 38 different resistor styles listed in Specification JAN-R-26A, 33 of the most popular styles are offered to meet requirements of Characteristics "G" and "J" of the specification. These styles represent five types, as follows: tab terminal; tab terminal with hole to clear

No. 8 screw; ferrule terminal; flat type-tab terminal; and axial terminal.—**Ohmite Manufacturing Co., 4981 Flournoy St., Chicago 44, Ill.**—TELE-TECH

Power Amplifier

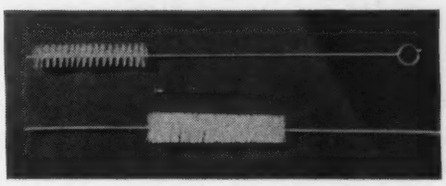
The KT66 power amplifying tube is now available in the United States. It can be used in the output stage of



quality audio amplifiers and also as an oscillator of r-f power amplifier for frequencies up to 30 MC. The KT66 is a high slope, indirectly heated beam tetrode suitable for either single or push-pull audio operation and may be employed as a triode with screen connected through a 100 ohm resistance to the anode. The KT66 and the American 6L6 can work interchangeably in any circuit; pins and connections of both are identical.—**British Industries Corp., 105 Duane St., New York 13, N. Y.**—TELE-TECH

Brushes

Equipment and components which could not be cleaned or properly maintained because of their size and close



tolerances can now be handled with new nylon and goats hair brushes which have been designed to overcome this problem. Brushes are made to order, being adapted or modified to fit the particular item or job. Samples will be sent on request. If specifications sketch, or actual part are sent to the manufacturer, a brush will be returned for the specific applications.—**Walter Borten Co., Furnace Dock Rd., Peekskill, N. Y.**—TELE-TECH

TV Picture Tubes

Featuring RCA-developed electrostatic focusing, the three new rectangular picture tubes 14GP4, 17GP4, and 20GP4 re-

quire no focusing coil or focusing magnet with resultant important savings in critical material. Each of these new electrostatic-focus types uses an electron gun of improved design to provide good uniformity of focus over the entire picture area. Furthermore, focus can be maintained automatically with variation in line voltage and with adjustment of picture brightness. Need for alignment of a focusing magnet is eliminated and therefore tube installation and adjustment for optimum performance are simplified. Because the electron gun is designed so that the focusing electrode takes very little current, the voltage for the focusing electrode can be provided easily and economically. The 14GP4 (illustrated) is of the all-glass type with external conductive bulb coating, has a maximum high-voltage rating of 14 kilovolts (design center), and produces brilliant 11⅜ x 8½ in. pictures on a face made of Filterglass. The 17GP4 is of the metal-shell type, has a maximum high-voltage rating of 16 kilovolts (design center), and produces brilliant 14⅝ x 11 in. pictures on a relatively flat, high-quality face made of frosted Filterglass. The 20GP4 is of the all-glass type with external conductive bulb coating, has a maximum high-voltage rating of 18 kilovolts (design center), and produces brilliant 17¼ x 13¼ in. pictures on a Filterglass face. Employing magnetic deflection, each of the three types has a diagonal deflection angle of 70° and a horizontal deflection angle of 66°.—**Tube Dept., Radio Corporation of America, Harrison, N. J.**—TELE-TECH

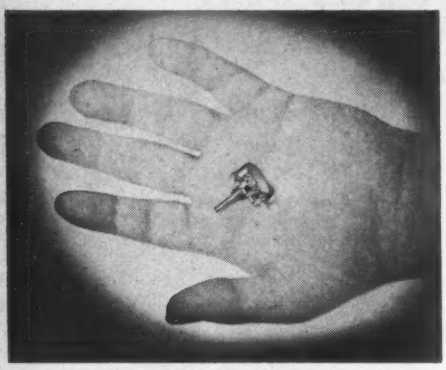
Motors

A new line of advanced design subfractional horsepower electric motors has been designed for fan and blower duty

as well as straight drive motors. These motors (400 cycles, 60 cycles, variable frequency) are embedded in a rigid die cast housing with riveted stator and stainless steel thru-bolts, giving positive bearing alignment and a constant air gap at all times. The 400 cps types range up to 1/35 HP at 10,000 rpm, and 1/50 hp at 7200 rpm in either single or three phase.—**Air-Marine Motors, Inc., 2183 Jackson Ave., Seaford, L. I., N. Y.**—TELE-TECH

Variable Resistor

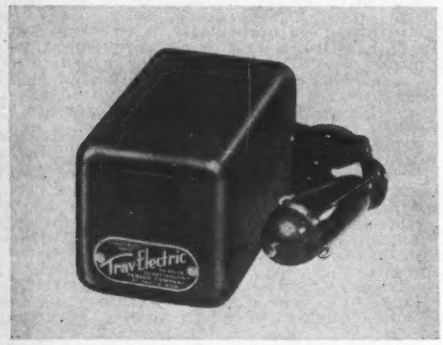
A new, miniaturized variable resistor has been developed with high temperature and humidity stability characteris-



tics. Precision engineered for military use, type 65 variable composition resistor is manufactured from specially developed materials which permit the successful combination of miniature size with the ability to remain stable during severe temperature and humidity changes.—**Chicago Telephone Supply Corp., Elkhart, Ind.**—TELE-TECH

Converter

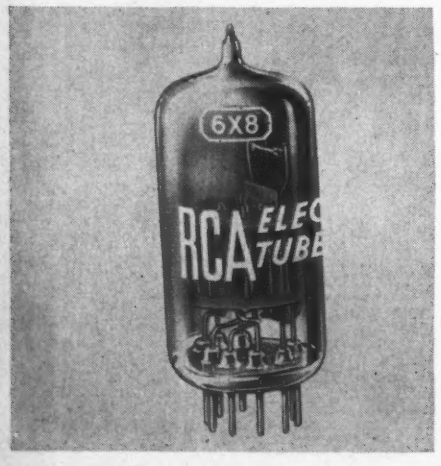
The model 6-1160 converter changes 6 volt dc to 110 v. ac (60 cps) with a 40 to 45 watt capacity maximum. Known as



the "Trav-Electric", it is designed for operation from an automobile battery and can be connected directly to the battery or to cigar lighter on dashboard. Model 12-1160 will convert 12 v dc to 110 v. ac. —**Terado Co., St. Paul 8, Minn.**—TELE-TECH

Triode-Pentode Converter

The new, 9-pin miniature type 6 x 8, containing a medium-mu triode and a sharp-cutoff pentode, is designed especially for use as a combined oscillator and mixer tube in television receivers utilizing an i-f in the order of 40 MC. In such service, a single 6 x 8 gives converter performance comparable to that obtainable with a 6AG5 as mixer and one unit of a 6J6 as oscillator. The pentode



unit may be used in the AM section of a pentode mixer to provide high gain, and in the FM section either as a pentode mixer or as a triode-connected mixer depending on signal-to-noise considerations. The triode unit makes a satisfactory oscillator for either the AM section or the FM section.—**Tube Dept., Radio Corporation of America, Harrison, N. J.**—TELE-TECH

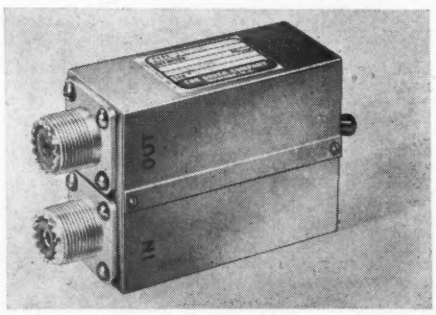
Two-Way Radio System

An all-electronic selective dispatching method for two-way radio systems permits "private" conversations between a dispatcher and an individual mobile unit, or a specific group of mobile units within a two-way radio system. A mobile operator, under the new method, would hear fewer calls not intended for his attention, reducing the number of callbacks and repeats, and lessening driver fatigue. The tone signals are within the 300-3000 cycle range, permitting their use over any circuit which will pass voice, including telephone line. The mobile receivers are activated within one-half second after the dispatcher pushes the control button. The equipment attached to the mobile unit has no moving parts or contacts. It uses standard receiving type tubes and is directly ap-

plicable to any FM communications receiver. It is stable, and will stay on frequency indefinitely. No tuning or other adjustments are necssary with the new equipment, which is immediately applicable to either 6 or 12 volt power supply.—**General Electric Co., Syracuse, N. Y.**—TELE-TECH

Video Roll-Off

The Daven V-103 video roll-off network is designed to provide the standardized bandwidth required when per-



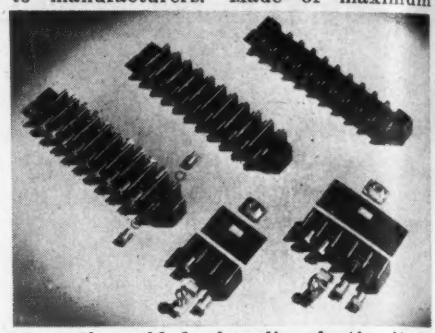
forming operating measurements. The frequency characteristics provides a 6 db roll-off at 3 MC with reference to the low frequencies. The circuit is a three mesh, 73 ohm constant impedance network and provides a rise time of approximately 0.175 microseconds without overshoot. A suitable switch is provided for "straight through" operation, which removes the network and restores the original wide band characteristics of the scope.—**Daven Co., 191 Central Ave., Newark 4, N. J.**—TELE-TECH

FM Pocket Radio

The Micronet pocket radio covers the full FM band of 88 to 108 MC and receives television sound on channels 5 and 6. It has a built-in telescoping antenna and self-contained batteries. Known as the model RD-02, it measures only 5 x 2½ x 1 in. and weighs 6 oz. It is said to operate on trains, automobiles, and inside steel buildings with no external aerial.—**Micro-Electronic Products Co., Inc., 11 West 5th St., Peru, Ind.**—TELE-TECH

Terminal Block

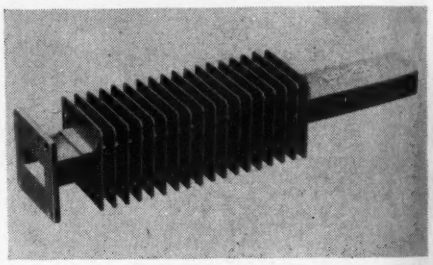
A new terminal block, originally developed for the Navy, is now available to manufacturers. Made of maximum



strength molded phenolic plastic, it is designed for high voltage insulation. It completely eliminates non-functional materials and its compactness takes advantage of the smallest operating space. Segregated, individually accessible connections make installation and service fast and efficient.—**Shaw Insulator Co., 160 Colt St., Irvington, N. J.**—TELE-TECH

Power Dissipating Terminations

Model 912A is a high-power termination designed for use as a dummy lead for high-power transmitters, in testing



vacuum tube characteristics and transmitter output. It consists of a rectangular waveguide section containing a high loss material carefully tapered for low VSWR. Cooling fins on waveguide exterior effectively dissipate power absorbed by the unit. The 912A high-power termination, maximum VSWR 1.1, is offered in sizes 3 x 1½ in. and 1 x ½ in. The 910A terminations, maximum VSWR 1.06 are offered in six sizes, 3 x 1½ in., 2 x 1 in., 1½ x ¾ in., 1¼ x ⅝ in., 1 x ½ in., and .702 x .391 in.—**Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Cal.**—TELE-TECH

Volt-Ohm-Milliammeter

Accurate and compact design provides the thinnest volt-ohm milliammeter of its kind. Large 5 in. lucite meter case gives

increased readability. It is guaranteed to be unbreakable and shock resistant case protects instrument's high sensitivity. It is rated at 20,000 ohms per volt dc; 5,000 ohms per volt ac; and has ac-dc voltage range of: 2.5, 10, 50, 250, 1,000, 5,000. Milliamp scales (dc) are: 2.5, 10, 50, 250, 1,000 and microamps (dc) are: 0 to 50. Resistance scales are: 0 to 1,000; 0 to 10,000; 0 to 1 meg.; 0 to 100 meg. Portable, heat and acid resistant case is supplied with leather handle—**Hickock Electrical Instrument Co., 10606 Dupont Ave., Cleveland 8, Ohio**—TELE-TECH

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WASHINGTON
News Letter

Latest Radio and Communications News Developments Summarized by TELE-TECH's Washington Bureau

TV FREEZE OUTLOOK — Start of the long-awaited hearings by the FCC on the city-by-city television allocation proposals which were slated to commence July 9, holds little hope for the lifting of the "freeze" on all new television station construction even by the end of this year. The "freeze" will round out its third anniversary on next Sept. 30. FCC leadership, including Chairman Wayne Coy who was reappointed for another seven-year term on the Commission, realize the television allocation proceedings will last for months, while at least two months would be consumed in rendering a decision. Even with a final determination by the FCC, there seemed certain to be a series of hotly contested comparative hearings in major cities, particularly for VHF assignments, and this also means further delays in FCC action on its projected master allocation plan and specific city allocation.

MOBILE RADIO—Armed Services, FCC and Federal Civil Defense Administration all have been interested in maintaining mobile radio communications systems in operation where these are important in the national defense emergency. For such important industrial mobile radio services as those for the petroleum and public utilities industries, marine radio and radar and aeronautical communications-electronic aids to navigation, the Armed Services have aided in presenting their critical materials' applications to the NPA. The Federal Civil Defense Administration has strongly backed equipment and maintenance needs for the police and fire departments' radio systems as well as for certain strategic bus line and taxicab radio fleets. The FCC has rendered mobile radio services with a mobilization value, excellent backing during these times of growing materials shortages due to the defense situation.

NO SURPRISE IN D.C. CIRCLES—The opinion of the U.S. Supreme Court in upholding the decision of the Federal Communications Commission which had sanctioned the method of color television by Columbia Broadcasting System and which has been the most controversial issue in the history of the FCC, was no surprise to Washington newspaper men. The final outcome of the affirmation of the FCC position by the nation's highest judicial tribunal had generally been taken for granted. (In fact, readers of this column in TELE-TECH may recall that this final result had been forecast at the time the appeal of the Commission's order was taken to the three-judge U.S. statutory court in Chicago.)

GUIDING PRINCIPLE — The 8-to-0 Supreme Court ruling as expressed in the majority opinion of Justice Hugo Black merely adhered to the guiding principle of the past decade by the Federal Judiciary that Federal governmental regulatory agencies are assumed to have greater expert technical knowledge of issues in their proceedings than the courts. The Supreme Court which established this legal guidepost has rarely departed from it in reviewing the findings of administrative-regulatory agencies and usually holds that the determinations of the government agencies ought to be approved by the courts if the agencies have based their decisions on adequate evidence and have not violated constitutional rights.

MANY HURDLES; SHORTAGES—Despite the victory of the Columbia Broadcasting System, and even the progress of the all-electronic method of the Radio Corporation of America, there appear to be a number of really stiff and practical hurdles in the course of the "birth" of color television in the near future as a public video service—and the newspaper press has rather generally overlooked these obstacles. Of course, foremost is the shortage of critical metals and materials due to the growing production by the electronic-radio manufacturing history for the Armed Services; and these shortages as all know in the industry—and the general press seems to disregard—mean limited allocations of critical metals to the manufacturers for civilian production. Military production this summer and fall and next year, as is well known, will absorb the major share of copper, nickel, zinc and other metals vital to our equipment, tubes and components.

BETTER SYSTEM—The reaction given TELE-TECH's Washington news bureau from some of the most authoritative sources in the Armed Services, National Production Authority and Defense Production Administration, was that, even granted color television is a most desirable step in video progress, the present national defense emergency is a task of much greater priority for the electronic-radio manufacturing industry. The key to the whole issue might well be found in the "dubitante" opinion of Justice Frankfurter commenting that the present color-television systems did not seem ready for public service. The fact that every national defense mobilization period greatly stimulates electronic-radio development and progress would appear to make it imperative upon the FCC in the true "public interest" to reopen the color television proceeding and examine the progress which has been made in color video since its sanction of the CBS method last September.

National Press Building
Washington, D. C.

ROLAND C. DAVIES
Washington Editor

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It's no gamble when you choose Thomas premium quality for the odds are almost 100% *on your side.* Whether you order fifty or 65,000 Thomas Tubes, you are assured of only the highest quality production control. Because every step in the making of a Thomas picture tube is followed through with the foresight, intelligent planning, sound engineering, continuous research and attention to detail by Thomas designers, engineers and technicians whose experience goes back to the beginning of electronic tube history. This is why so many famous-name TV set makers buy Thomas Photo-tron tubes. See list of 20 at left of this page.

ELECTRONICS, Inc.
PASSAIC, N. J.

TE1

TELE-TECH's NEWSCAST

Bell Plans New York Radio Relay Routes

Applications for permission to expand microwave radio relay facilities in the upper New York State area, including construction of a new link between Syracuse and Rochester, have been filed with the Federal Communications Commission. The growing demand for more long distance telephone circuits across the Empire State, plus anticipated network television requirements, would be served by the proposed expansion.

On completion, the expanded system would provide a total of six broad band radio relay channels between Albany and Buffalo, four of which would be reserved for long distance telephone message service and two for television transmission. The four broad band telephone channels, two in each direction, would provide initially about 550 long distance telephone circuits between Albany and Syracuse and about 400 between Syracuse and Buffalo.

Present microwave facilities in the area are being used for television transmission only. Schenectady, Utica and Syracuse are now connected to Albany by a two-channel television system. Binghamton is served by a single-channel leg off this system.

Rochester receives network television programs from Buffalo over a radio relay hookup. Buffalo is connected to the network by a coaxial cable running from Cleveland, O., via Erie, Pa.

New Color TV Tube

A new method of introducing color into television picture tube presentations has been patented by Thornton Chew, vice president in charge of engineering for KFMB, San Diego.

The new method of obtaining color comprises parallel "U" shaped troughs on the inside face of the tube screen. One side of each trough is coated with one of the color phosphors red, blue and green. An external magnetic field is arranged to bend the electron beam into one or other of the sides of the trough and thus control the color produced on the screen. When there is no magnetic field in operation the beam hits the bottom of the "U", and activates the phosphor color deposited there. In the words of the inventor "the tube employs a varying magnetic field to select, sequentially, the discrete areas of primary color phosphors." This tube should be equally effective for use in both field sequential and dot sequential systems.

Texas Eastern Plans New Microwave System

Plans for one of the most extensive and modern microwave systems in the United States have been announced by Texas Eastern Transmission Corporation. Designed to expedite the flow of natural gas from Louisiana and Texas fields to the highly industrial East, the system will employ Pulse Time Modulation Multiplex equipment developed and manufactured by Federal Telephone and Radio Corp., Clifton, N. J. The route of the system will be from the company headquarters at Shreveport, La. to Kosciusko, Miss., then along the route of the 30 in. pipe line now under construction to Connellsville, Pa., and from there to the Eastern terminal at Linden, N. J.—a distance of approximately 1,400 miles. This system will provide various communication facilities between Shreveport, the pipe line compressor stations, and divisional offices along this route.

SPRAGUE ELECTRIC CELEBRATES 25TH ANNIVERSARY

Marking the 25th anniversary of the founding of the Sprague Electric Company, North Adams, Mass., Robert C. Sprague president of the company and chairman of the board of the Radio Television Manufacturers' Association, cuts the cake presented to him by employees. The first slice goes to the third generation—Robert C. Sprague III—while father Robert C. Sprague, Jr. steadies his son's hand. Participating in the ceremonies is vice-president Julian K. Sprague (second from left)

Coming Events

July 4-14—British Instrument Industries' Exhibition, National Hall, Olympia, London, England.

July 16-19—National Association of Music Merchants, 50th Annual Convention and Trade Show, Palmer House, Chicago.

August 15-18—Associated Police Communciation Officers, 1951 Conference, Everglades Hotel, Miami, Fla.

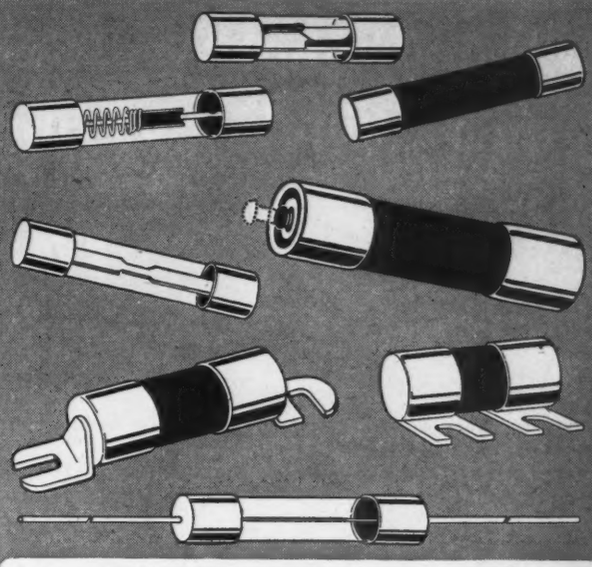
August 22-24—7th Annual Pacific Electronic Exhibit, 1951 IRE Western Convention, Civic Auditorium, San Francisco, Calif.

September 10-14—Sixth National Instrument Conference and Exhibit, Sponsored by Instrument Society of America, Sam Houston Coliseum, Houston, Texas.

September 11-13—National Electronic Distributors Association, 1951 Convention and Show, Cleveland, Ohio.

October 22-24—Seventh National Electronics Conference, Edgewater Beach Hotel, Chicago, Ill.

When you need a FUSE—think of BUSS



THE MOST COMPLETE LINE OF FUSES FOR THE *Electronic Industries*

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Whatever your needs in electrical protection there's a Buss fuse made to fit.

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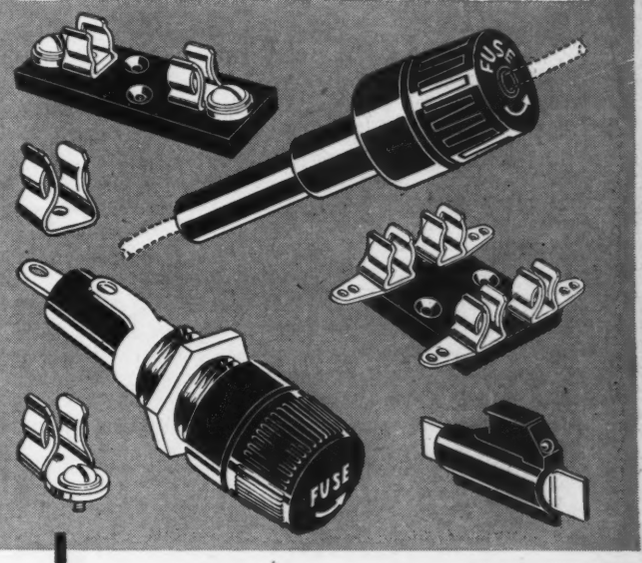
These fuses are SPACE SAVERS.

They are particularly well suited to the protection of instruments, radios, television and electronic equipment of all kinds, aircraft, automobiles, coin-operated devices and any apparatus where space for the protective device is at a premium.

Fuses of the Dual-Element, Renewable and One-Time type are available.

Companion lines for FUSETRON and BUSS small dimension fuses are BUSS Fuse Clips, Blocks and Fuse Holders. They are made in many types and sizes to make it easy to select the fuse and fuse-mounting needed to give the required protection.

For full information ask for the BUSS Bulletin on Small Dimension Fuses and Fuse Holders — Form SFB.



SPECIAL FUSES, FUSE CLIPS, FUSE BLOCKS and FUSE HOLDERS

Sometimes a special fuse or fuse mounting is required. In such cases we welcome your requests either to quote—or to help in designing or selecting the special type of fuse or fuse mounting best suited to your particular conditions.

Submit description or sketch, showing type of fuse to be used, number of circuits, type of terminal, etc. If your protection problem is still in the engineering state, tell us current, voltage, load characteristics, etc.

At any time our staff of fuse engineers is at your service to help solve your problems in electrical protection.

USE THIS COUPON—*Get all the facts*

Bussmann Mfg. Co., University at Jefferson
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Please send me Bulletin SFB containing complete facts on Buss Small Dimension Fuses.

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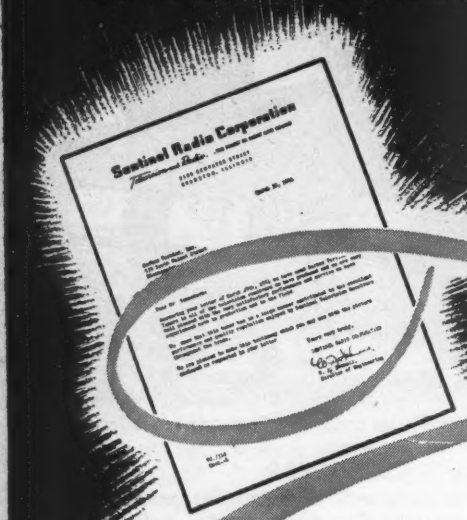
Here's what W. J. SCHNELL, of Sentinel, says about the Tarzian Tuner



We have used Sarkes Tarzian Tuners in all of the television receivers we have produced and we are very well pleased with the very satisfactory performance and service we have experienced both in production and in the field.

We know that this tuner has in a large manner contributed to the excellent performance and quality reputation enjoyed by Sentinel Television Receivers throughout the trade.

W. J. SCHNELL,
Director of Engineering,
Sentinel Radio Corp., Evanston, Ill.

We can't honestly say this is an unsolicited statement. Sure, we wrote to Bill Schnell. Asked him point blank what he, as director of engineering for one of our oldest customers, actually thought about the TARZIAN TUNER. Naturally, we were pretty sure of what he'd say, for engineers appreciate the many desirable features—such as pin-point oscillator alignment . . . unexcelled stability—which are characteristic of the TARZIAN TUNER. Manufacturers are invited to write for complete engineering data on the TARZIAN TUNER.

SARKES TARZIAN, Inc.

Tuner Division • Bloomington, Indiana

TV Interference from Police Transmitters

An apparently overlooked source of television interference which may occur in increasing amounts on new receivers is that from police transmitters. Operating in the 40 MC band these transmitters are currently reported to be raising their power to as much as 5 kw. The effect of a strong local transmission smack in the middle of the i-f band will cause quite severe interference to the TV receivers. Probably the problem will eventually be solved by adequate shielding and filtering.

Bendix Dedicated by General James Powell

On May 17 Major General James T. Powell, chief of the Air Force Training Command, dedicated the Bendix School of Electronics at Pimlico Field, Maryland. The principal speaker, Col. R. Griffin, director of communications and electronics, Langley Field. E. K. Foster, vice president of Bendix also participated in the dedication. The school trains radio and radar specialist technicians to work with military and civilian users of Bendix equipment throughout the world.

New Coil Manufacturer

Aero Coil Inc., 507 26th Street, Union City, N. J., announces availability of complete facilities for engineering, design and production of all types of radio frequency coils and coil assemblies. Firm is headed by Victor G. Matto. Peter Bedoian is general manager and Walter J. Bonazza, formerly of Hazeltine Electronics Corp., has been named chief engineer.

Radar Contract Awarded to Westinghouse

An $8,500,000 contract for the production of radar equipment for the Navy has been awarded to the Westinghouse Electric Corp., Springfield, Mass. The contract is for search-type radar sets, recently designed by Westinghouse engineers at Baltimore, Md.

Heldor Expands

Heldor Manufacturing Co., Division of Heldor Bushing & Terminal Co., Inc. of Bloomfield, N. J., has been organized to manufacture products formerly produced by Heldor Metal Products Corp. The company has leased one and a half floors in the industrial building at 225 Bloomfield Avenue, Bloomfield. Improved production equipment has been installed enabling the new company to increase the manufacture of MIL-T-27 transformer cans for stock delivery, and for hermetic-seal bushing assemblies.

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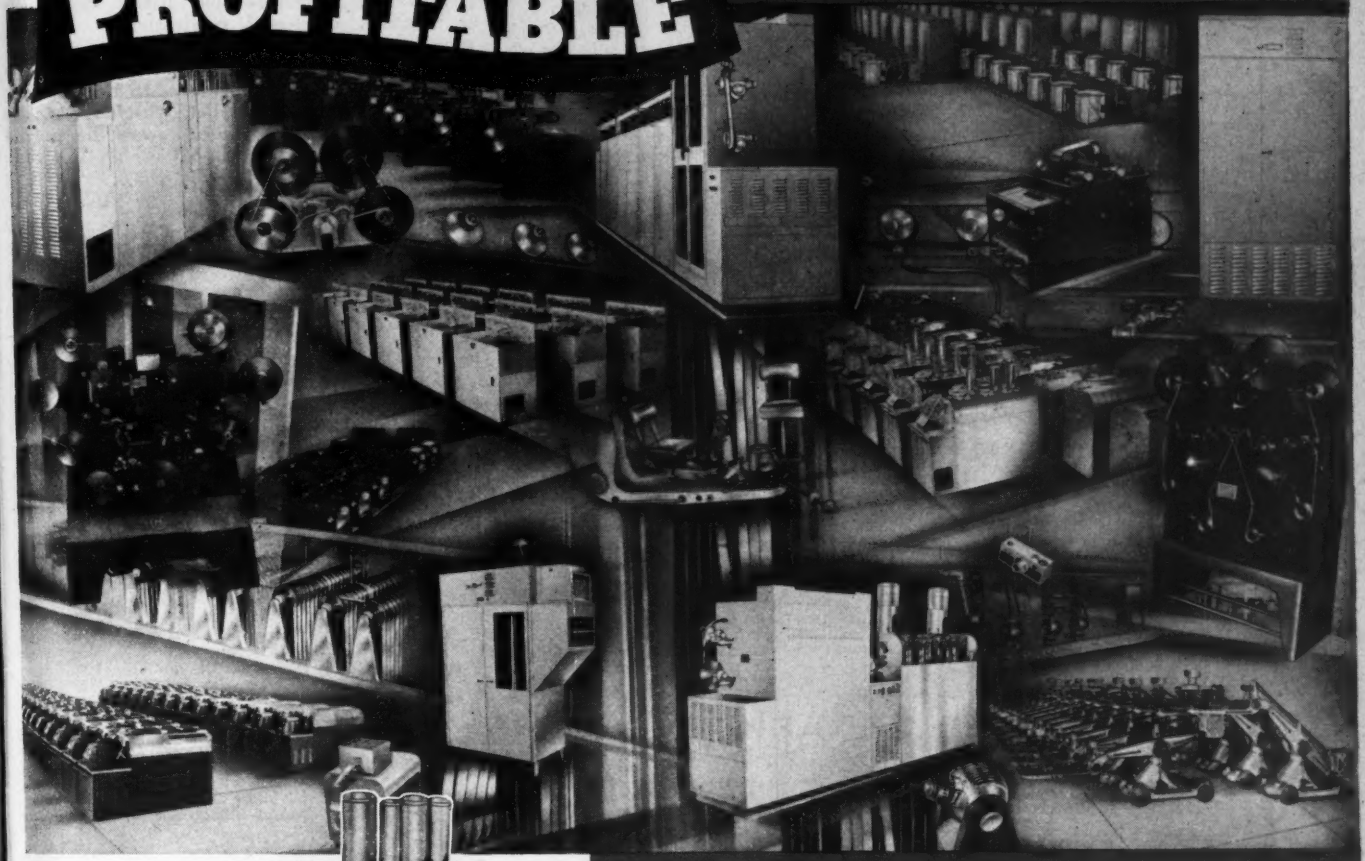

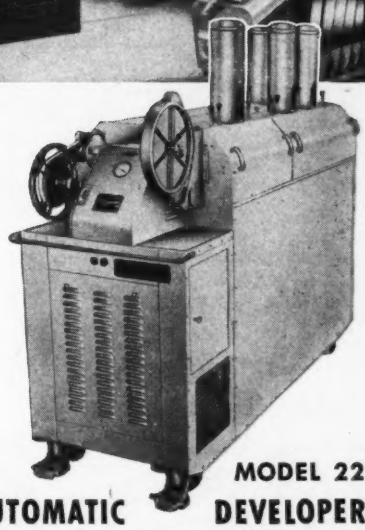

MODEL 22

AUTOMATIC DEVELOPER

Model 22 is a portable developing machine for 16mm black and white, negative, positive or reversal film. Operates in daylight. Capacity up to 60 feet per minute. Self contained, entirely automatic, easy to operate. Complete refrigeration, re-circulating systems, air compressor and positive temperature controls. Moderately priced.

More and more television stations are discovering the many advantages in operating their own film laboratory. It enables them to develop film of news events and special features and get it on the air in a matter of minutes. It gives them processing service that is days and weeks ahead of "out of town" schedules . . . a service that can be extremely profitable when offered to other film users in the community. Houston-Fearless processing machines handle the entire job from camera to screen under fully automatic control. Quality of work is unsurpassed. Houston-Fearless equipment has been standard of the motion picture industry in Hollywood and throughout the world for 20 years. Write for information on your individual requirements.

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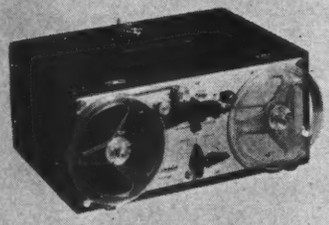
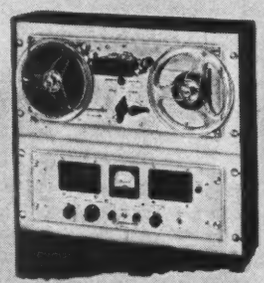


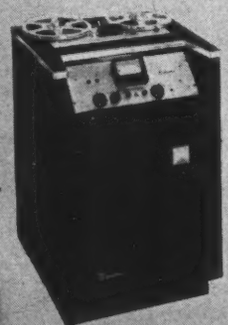
FLEXIBILITY

In rack or console, or in its really *portable* cases, the Magnecorder will suit every purpose. PT6 Series shown is the most widely used professional tape recorder in the world, and is available with 3 speeds (3¾", 7½", 15") if preferred.



FIDELITY

Lifelike tone quality, low distortion meet N.A.B. standards — and at a moderate price! PT63 Series shown in rack mount also offers three heads to erase, record, and play back to monitor from the tape while recording.



FEATURES

PT7 accommodates 10½" reels and offers 3 heads, positive timing and pushbutton control. PT7 Series shown in complete console model is also available for portable or rack mount. For outstanding recording equipment, see the complete Magnecord line — PT6, PT63 and PT7.

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MILITARY CONTRACT AWARDS

Manufacturers who have received contract awards for producing of radio-radar-electronic equipment for the Armed Services are listed below by name, city and equipment. Subcontractors interested in bidding on performance of any part of each contract should sell their services to these prime contractors. This list, which is current up to our press time, covers the period from May 2 to May 31.

Amplifiers

Air Associates, Teterboro, N. J.; Eclipse Pioneer Division, Bendix Aviation Corp., Teterboro, N. J.; Eltron, Inc., Jackson, Mich.; General Electric Co., Syracuse, N. Y

Antenna Group

Witco Mfg. Co., Dayton, Ohio.

Attenuators

Electron-Radar Prods., Chicago, Ill.

Capacitors

Bendix Radio Division, Bendix Aviation Corp., Baltimore, Md.; Erie Resistor Corp., Erie, Pa.; Radio Condenser Co., Camden, N. J.

Crystal Units

Standard Piezo Co., Carlisle, Pa.

Electron Tubes

Aero Instrument Co., Cleveland, Ohio; Anton Electronic Labs., Brooklyn, N. Y.; Bomac Labs., Inc., Beverly, Mass.; Chatham Electronics Corp., Newark, N. J.; Continental Electric Co., Geneva, Ill.; Federal Telecommunications Labs., Nutley, N. J.; General Electric Co., Schenectady, N. Y.; General Electronics, Paterson, N. J.; Lansdale Tube Co., Lansdale, Pa.; National Union Radio Corp., Orange, N. J.; Radio Corp. of America, RCA Victor Division, Harrison, N. J.; Raytheon Mfg. Co., Waltham, Mass.; Sylvania Electric Products, Boston; Tung-Sol Lamp Works, Newark, N. J.; Westinghouse Electric Corp., Dayton, Ohio.

GRC Control

Lionel Corp., Hillside, N. J.

Headsets

Duke Mfg. Co., Inc., Linden, N. J.; Pacific Electricord Co., Beverly Hills, Calif.

Hydrogen Thyratrons

Bomac Labs., Beverly, Mass.; Machlett Labs., Springdale, Conn.

Impedance Meters

Radio Frequency Laboratories, Boonton, N. J.

Indicators

Bendix Aviation Corp., Bendix Radio Division, Baltimore, Md.; Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.; General Electric Co., Schenectady, N. Y.; Kollsman Instrument Corp., Elmhurst, N. Y.

Inverters

Lion Mfg. Corp., Chicago, Ill.; Oster Mfg. Co., Cleveland, Ohio.

Magnetron Tubes

Raytheon Mfg. Co., Waltham, Mass.

Microwave Generators

Radio Corporation of America, RCA Victor Div., Camden, N. J.

Oscilloscopes

Television Equipment Corp., N. Y. City.

Pulse Generators

Harvey-Wells Electronics, Southbridge, Mass.

Radar Equipment

Bol, Ltd., N. Y. City; Radio Corp. of America, Camden, N. J.

(Continued on page 58)

The finest solder made for all television and radio work . . . Everything Electrical

Kester Solder

Uniform

Efficient

Kester Plastic Rosin-Core and Kester "Resin-Five" Core Solders are recognized by the trade as outstanding for the finest type of radio, television and electrical work.

These two Solders, which are available in the usual single-core type, can now also be had in a 3-core form.

Only highly skilled craftsmen are employed by the Kester Solder Company. Flux formulas and specifications are rigidly adhered to for perfect uniformity.

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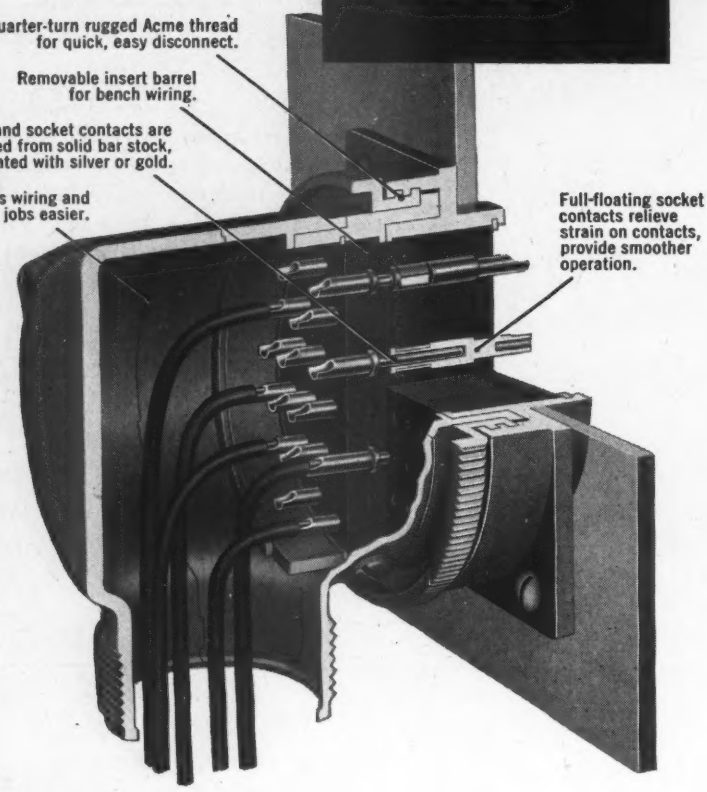
Here's why those in the know —demand

CANNON PLUGS


Quarter-turn rugged Acme thread for quick, easy disconnect.
Removable insert barrel for bench wiring.
Pin and socket contacts are precision-machined from solid bar stock, electroplated with silver or gold.
Split shell makes wiring and inspection jobs easier.
Full-floating socket contacts relieve strain on contacts, provide smoother operation.

Recognition of Cannon's 36 years of sound engineering and fine, uncompromising construction has built the demand for Cannon Plugs. Here we take an inside look at the lightweight Type "K" 90° connector, forerunner of the Army-Navy Series. More features of the "K" were incorporated into the "AN" design than any other connector.

Constantly improved over the years, Type "K" is now used for numerous applications such as aircraft, radio, television, sound, phone recorders, motion pictures, geophysical research and widely used throughout the electro-mechanical and electronic instrument fields.

The design and construction details in the Cannon "K" Series are typical of the care Cannon takes in producing more than 18,000 precision, multi-contact connectors to serve the exacting needs of industry.

We will gladly send you engineering bulletins describing each of the many basic types of Cannon Plugs if you will briefly describe your applications.

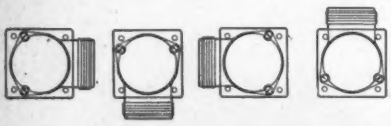


Diagram at left shows how the four positions of cable entry on the large 90° "K" endbell make the wiring job easier. Smaller Type "K" connectors have three positions.

CANNON ELECTRIC

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Cannon Electric Company
Los Angeles 31
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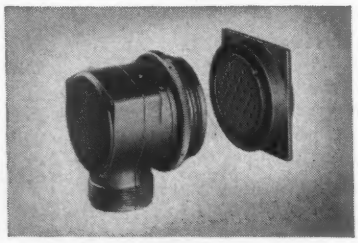
Factories in Los Angeles, Toronto, New Haven. Representatives in principal cities. Address inquiries to Cannon Electric Company, Department G-201, P. O. Box 75, Lincoln Heights Station, Los Angeles 31, California



Type "K" and "RK" connectors are available in 7 shell types having 8 diameters. Inserts have more than 190 contact arrangements. Some of these have Coax, Twinax or Thermocouple contacts as standard. Integral cable clamps available in all "K" plug types.

(*Continued from page* 56)

Radio Launcher

Radioplane Co., Van Nuys, Calif.

Radiosondes

Johnson Service Co., Milwaukee, Wis.

Recording Components

Daystrom Electric Corp., Poughkeepsie, N. Y.; Link Aviation, Inc., Binghamton, N. Y.; Telectro Industries Corp., L. I. City, N. Y.

Relays

Hartman Electrical Mfg. Co., Mansfield, Ohio.

Remote Control Equipment

S. H. Couch Co., Inc., North Quincy, Mass.

Resistors

Fairchild Camera & Instrument Corp., West Coast Div., Pasadena, Calif.; Van Dyke Instruments, Inc., St. Petersburg, Fla.

Telephone and Telegraph Equipment

The Ansonia Electrical Co., Ansonia, Conn.; Western Electric Co., New York City.

Transformers

Standard Electric Products Co., Dayton, Ohio.

Transmitting and Receiving Equipment

David Bogen Co., N. Y. City; Collins Radio Co., Cedar Rapids, Iowa; Eclipse Pioneer Division, Bendix Aviation Corp., Teterboro, N. J.; Federal Telephone & Radio Corp., Clifton, N. J.; Gates Radio Co., Quincy, Ill.; Hallicrafters Co., Chicago, Ill.; Radio Corp. of America, Camden, N. J.; Radioplane Company, Van Nuys, Calif.; Raytheon Mfg. Co., Waltham, Mass.; Stamford Electronics Co., Stamford, Conn.; Sylvania Electric Products Corp., Buffalo, N. Y.; Utility Electronics Corp., E. Newark, N. J.; U. S. Gauge Division, American Mch. & Metals, Sellersville, Pa.; Western Electric Co., Inc., New York City; Wickes Engineering & Construction Co., Camden, N. J.

Waveguides

Gilfillan Brothers, Inc., Los Angeles, Calif.

Defense Contracts

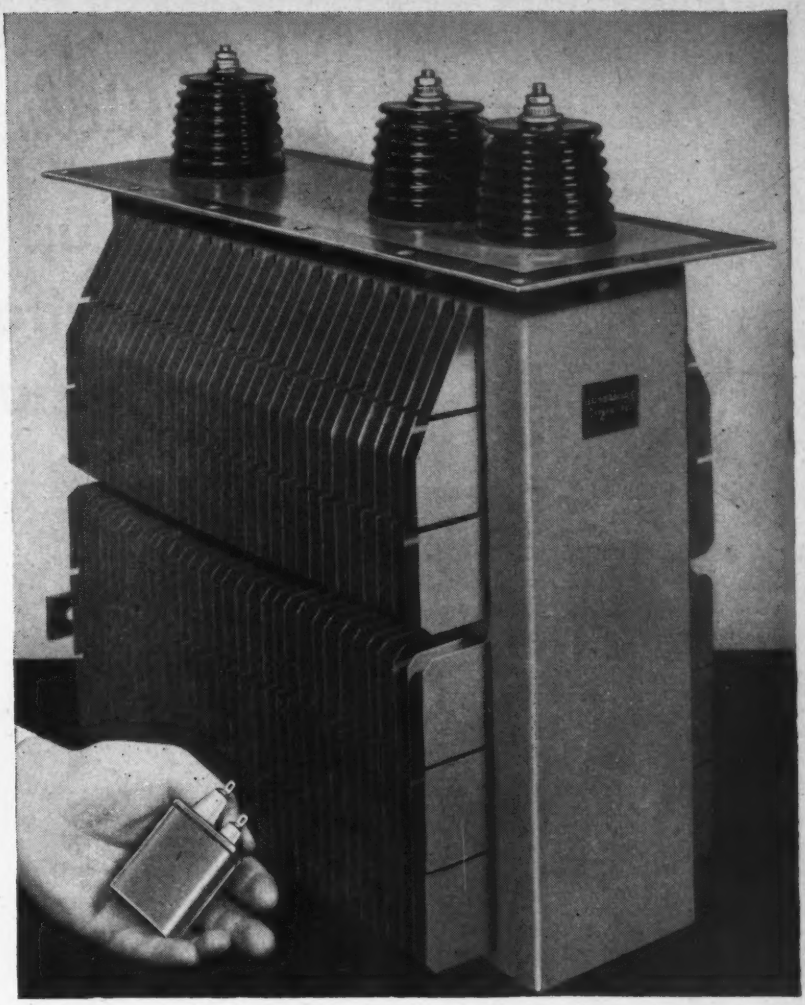
(*Continued from page* 24)

now receiving a sprinkling of prime contracts and not enough subcontracts to keep their plants working.

Both industry and the Department of the Army will find solace in the fact that contracting actions have been stepped-up during the two months of April and May by approximately $1.5 billion per month. This rate is holding firm for June—and will continue to rise so that by fall 1951 the nation will be in a peak period of defense production. There may be a lag, but the impact will certainly be felt throughout all levels of industry and it is anticipated that a re-analysis made four months from now may show that defense planners have not stayed awake nights for nothing.

While subcontracting will be intensified in the coming months, the total monies to be spent for radio-electronic equipment in the coming months is estimated to be the same as was published in the May issue of TELE-TECH—$2.1 billion for the calendar year 1951; $2.5 billion for the calendar year 1952.

pulse-forming Network Capacitors are dependable



for guided missiles—aircraft—land and sea radar equipments

The keystone to good service on network capacitors is complete information. Your G-E representative has a check-list of twenty-three questions that must be answered to assure you of dependable capacitor performance. And on important propositions, to simplify your design problems, it is highly desirable that a design engineer be called into the discussions as early as possible. Arrangements for such consultations can be made through any Apparatus Sales Office of the General Electric Company.

Whether you expect a service life of 10,000 hours or just 60 seconds, G.E. networks, designed to meet exacting specifications, will give you the reliable performance you require.

Pulse networks are a highly specialized field of capacitor engineering and experience is an important part of proper design work. G.E. has built networks for every type of pulse radar equipment since the inception of radar.

Since 1944, G.E. has been running continuous life tests on many types of networks to obtain more complete research data. These tests are being used to establish life limitations under various conditions of highly critical temperatures and voltages on all types of dielectrics, bushings, materials for coil forms and treating processes. Take advantage of this wealth of information and experience. Your inquiry addressed to Capacitor Sales Division, 42-304, General Electric Company, Pittsfield, Mass. or your nearest Apparatus Sales Office, will receive prompt attention.

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Completely self-contained, the PC-4 requires no outside attachments other than the Standard Capacitor against which the unknowns are to be checked. Operates on 110 Volt—60 cycle AC. Range: 10 mmfd to 1000 mfd. Size: 18″ x 12″ x 12″. Weight: approximately 35 lbs. For complete details, write for Catalog Sheet 7-TT.

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W. R. G. BAKER HONORED

W. R. G. Baker, General Electric vice president received an honorary degree of doctor of engineering at Syracuse University, Syracuse, N. Y. recently for his accomplishments as "scientist, engineer, industrialist, and top-flight leader of men."

Dage Electric Organized

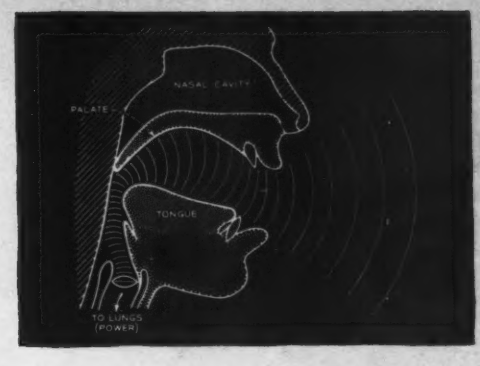
The Dage Electric Co., 4007 East Michigan St., Indianapolis 1, Ind. has been formed by George H. Fathauer, formerly vice president and chief engineer of Industrial Development Associates, Inc. The new company, which will concentrate on the manufacture of r-f cable connectors and special electromechanical assemblies, has complete engineering facilities as well as a flexible production setup to quickly supply all types of r-f connectors.

Metal Stripping Service Inaugurated by Stratford

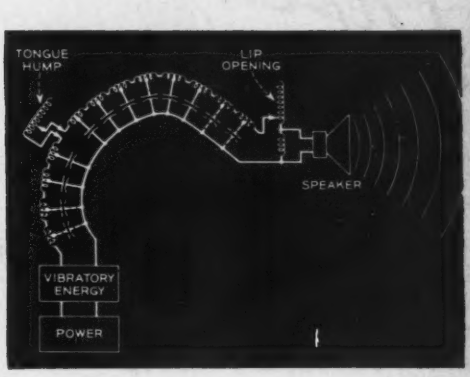
Stratford Company, Dept. J, 207 Bay St., Bridgeport, Conn., has announced the development of a new stripping process for removing metal coatings. It is stated that chromium, nickel, and copper can be stripped from zinc-base alloys, aluminum, copper brass and steel without etching or pitting of the base metal. Zinc diecastings are stripped cleanly so that they can be rebuffed to a high lustre by means of only a wheel wipe. Customers' samples are processed free and quotations are given promptly. The process is not for sale.

GE Develops Translator for UHF-TV Reception

General Electric has developed a small television "translator" which will tune in ultra-high-frequency telecasts when attached to any TV receiver ever made by the company. The translator looks like a small table radio. It will receive all the proposed new UHF channels and can be installed by the set owner in most cases.



It tells how you talk



The machine at the left is saying "Ah!" It's the new electrical vocal system developed at Bell Laboratories. Top sketch shows human vocal system also saying "Ah!" The electrical model is sketched below it. Energy source at bottom of "tract" can emit a buzz sound, like vocal cord tone, or the hiss sound of a whisper.

No one else speaks exactly like you. Each of us uses different tones to say the same words. To study and measure *how* we make speech, acoustic scientists of Bell Telephone Laboratories built a model of the vocal system.

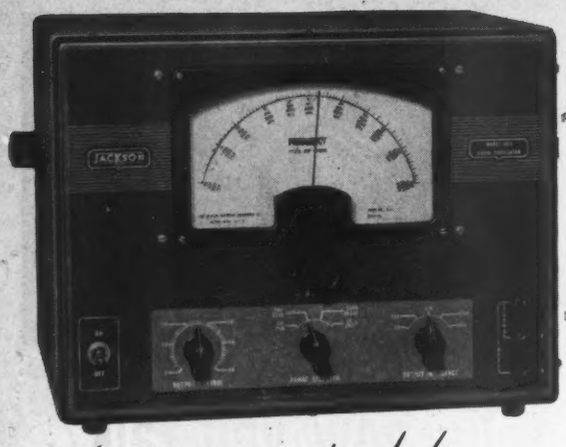
Electric waves copy those of the vocal cords, electric elements simulate the vocal tract, and, by adjustments, vowels and consonants are produced at pitches imitating a man's or woman's voice.

Using this electrical system, telephone scientists will be able the better to measure the properties of people's voices. Knowing more about speech they can find better and cheaper ways to transmit it.

This is another step in the research at Bell Telephone Laboratories which pioneered the exact knowledge of speech. Past work in the field is important in today's fine telephone service. A still deeper understanding of speech is essential in planning for tomorrow.

BELL TELEPHONE LABORATORIES

Exploring and inventing, devising and perfecting, for continued improvements and economies in telephone service.



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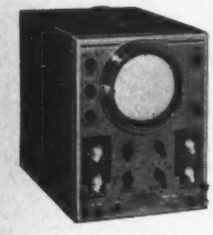
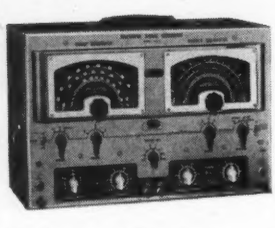
ACCURACY—Frequency calibration accurate to within 3% or 1 cycle. Complete stability is accomplished with a constant waveform—even at the extreme ends of the range. Spurious "beats" or signals are impossible in the output.
OUTPUT IMPEDANCE—Five values: 10, 250, 500, or 5,000 ohms impedance as well as additional resistive range, all controlled by a single selector switch.
OUTPUT POWER—500 milliwatts.
OUTPUT CONTROL—Continuously variable from zero to maximum.
WAVEFORM—Less than 5% Harmonic Distortion at all frequencies between 30 and 15,000 cycles.
FREQUENCY CHARACTERISTIC—Plus or minus 1 db between 30 and 15,000 cycles.
HUM LEVEL—Down more than 60 db of maximum power output.
VOLTAGE—For 105/120 volts, 50/60 cycles AC; 60 watts.
DIMENSIONS—13" wide, 9½" high, 9⅝" deep. Net weight, 26 lbs.
Furnished complete with all tubes.
Model 655. Users' Net Price, **$135.00**



Two Other Fine Jackson Instruments

MODEL CRO-2 OSCILLOSCOPE

5-inch oscilloscope having a vertical sensitivity of .018 RMS v.p.i. and band width flat within 1.5 db from 20 cycles thru 4.5 Mc. Linear sawtooth sweep oscillator 20 cycles thru 50 KC per second in 5 steps. A standard voltage provided for determining unknown Peak to Peak potentials of all waveforms. Has reversible vertical polarity and return trace blanking.



MODEL TVG-2 GENERATOR

Sweep Oscillator in three ranges from 2 Mc thru 216 Mc, all on fundamentals. Reversible sweep direction. Sweep width variable .1 Mc thru 18 Mc. Marker covers 4 Mc thru 216 Mc. Crystal Oscillator to use as Marker or Calibrator. Video Modulation from external source for using actual video signal for check, or for use with Audio Oscillator to produce bars for linearity checks.

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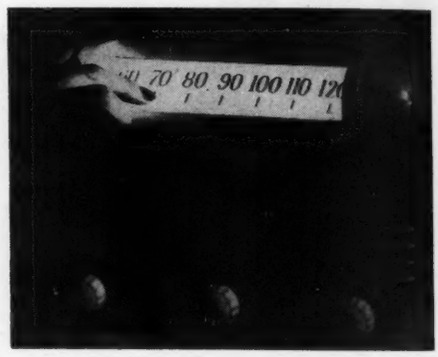
New Luminescent Dial Glasses

Lighted radio dial, shown in photo, in which the entire dial-plate is self illuminated employs new principle of "electroluminescence." Announced by Sylvania Electric Products Inc. and called "panelite" the material consists of a special sheet of conductive glass on which is placed a "phosphordielectric coating and a layer of vaporized aluminum. On application of 60 cycle power the glass will luminesce and from practical standpoint might be regarded as a luminous capacitor.



Lighted radio dial, employing new principle of "electroluminescence"

Raising voltage or frequency of the power supply will increase the light output from panelite. Varying the frequency will also change the color of the light output. At the present time these lamps are available in green only, but at a later date other colors such as yellow, light blue and white will be added.

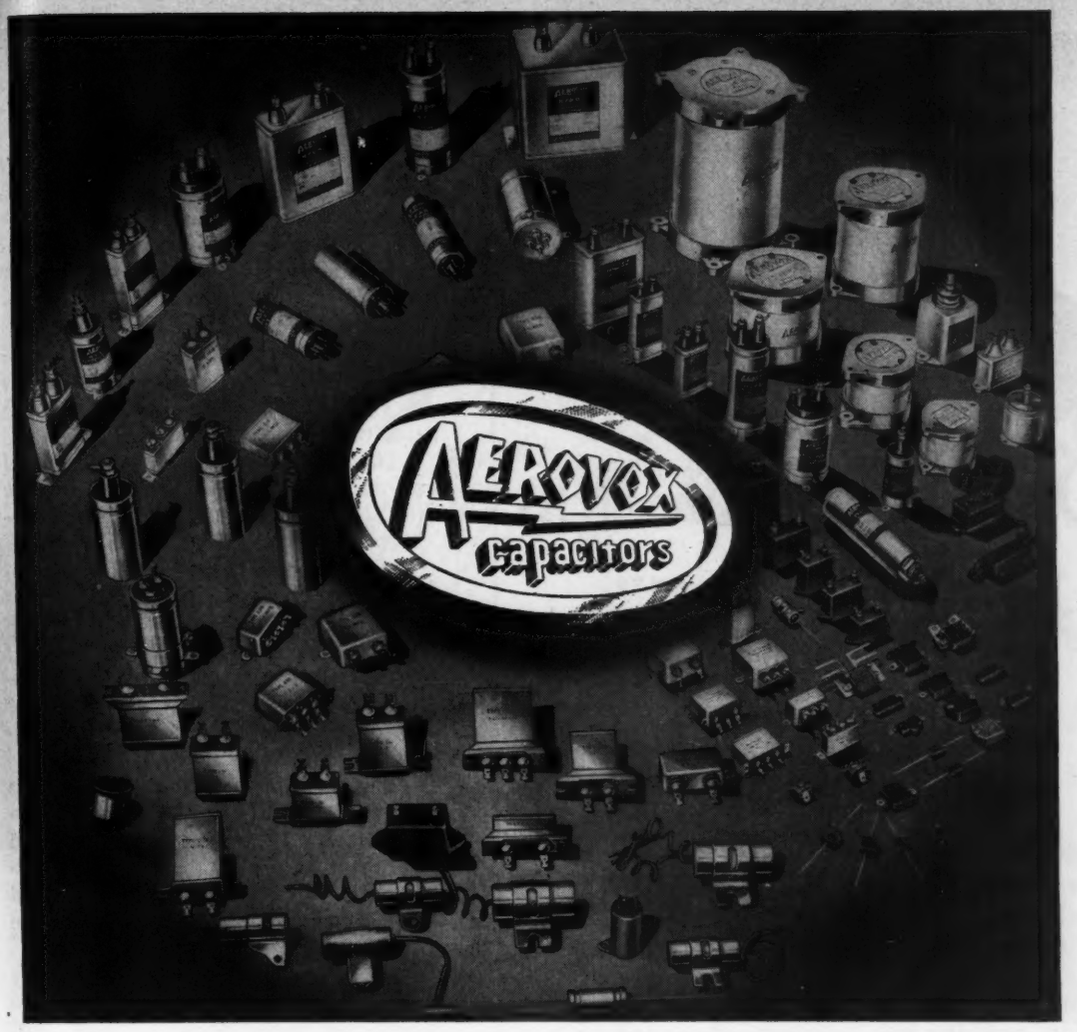
Green panelite lamps have a brightness of about 0.1 ft. lambert at 120 volts, 60 cps, and from 3 to 5 footlamberts at 600 volts. At 400 cps. brightness levels several times as high may be obtained. Life of these lamps is unknown but believed to be 2 or 3 years at a minimum since there is no filament to burn out. Power consumption is unbelievably low; a 4 ft. x 6 ft. panel consumes less than 75 watts.

Holleran to GE Post

John T. Holleran has been appointed manager of the Fort Edward and Hudson Falls operations of General Electric's Transformer and Allied Product Divisions at Fort Edward, New York.

New Tele-Vogue Exec.

Rex Wilson, formerly chief engineer, Tele-Vogue, Inc., 1735 Belmont Avenue, Chicago 13, Ill., manufacturing subsidiary of Muntz TV, Inc., has been elected vice-president in charge of engineering.



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• Literature on request. Submit that capacitance problem for engineering aid and quotations.

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Full utilization of space-saving factor, together with self-healing feature.

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Will Rogers

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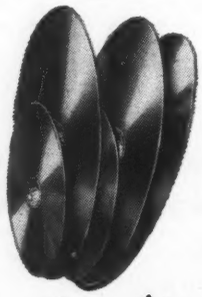
From Reeves Soundcraft Laboratories come magnetic tape offering users ten distinct features that add up to higher efficiency and fidelity; an assortment of recording discs to answer every requirement—all backed by the greater integrity and experience of the Reeves name, foremost manufacturer of recording and electronics accessories.

Soundcraft tape is made in all types and lengths to accommodate all tape recorders.

Soundcraft recording discs available in a variety of sizes, single and double face.



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Du Mont Allocations

(*Continued from page* 39)

ters, the DuMont Plan allocates 4 or more VHF channels to 47 communities, as against only 18 by FCC;

(4) In the top 50 population centers, the DuMont Plan assigns 4 or more VHF channels to 31 communities compared to 15 by FCC;

(5) In the top 25 population centers, the DuMont Plan allocates 4 or more VHF channels to 21 communities compared to 11 by FCC;

(6) The DuMont Plan allocates 3 or more VHF channels to 54 of the top 100 population centers as compared with only 43 by FCC;

(7) In the top 50 population centers, the DuMont Plan allocates 3 or more VHF channels to 37 communities as against 32 by FCC;

(8) In the top 25 population centers, the DuMont Plan assigns 3 or more VHF channels to 23 communities as against 22 by FCC.

The DuMont presentation points out that the FCC priorities for allocation of stations are unrealistic and were not adhered to by the Commission. DuMont assignments are based on the principle of efficient use of the spectrum to place stations:

(1) Where they will serve the largest number of persons and give them the widest choice of programs, while preserving service coverage for the nation's entire geographic area; and,

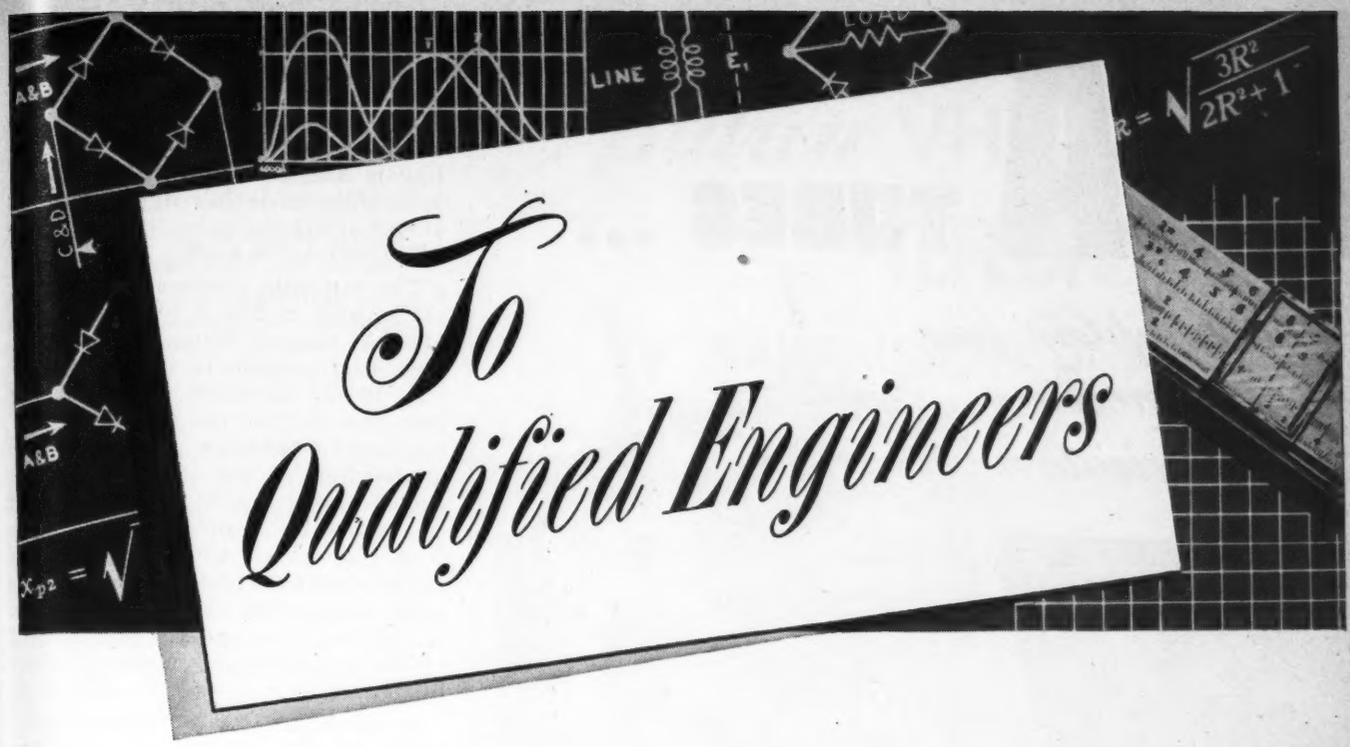
(2) Where they can be economically justified.

Dr. DuMont has acknowledged the fallibility of human choice by inaugurating a project at the Massachusetts Institute of Technology. This project is making use of M.I.T.'s automatic computing machine known as Whirlwind One.

It is proposed to feed into this automatic computer the entire problem of distributing available VHF channels across the nation as a means of eliminating human errors and guesswork. The Commission's permission has been requested to submit results of the Whirlwind project when completed.

Allison Producing New Airborne Radar Units

Allison Radar Corp., 11 West 42nd St., New York 18, N. Y., is now manufacturing airborne transport radar models E-2, ES-2, and ESB-2. Previous type models will no longer be produced.



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Whatever your plans for the future—you will find the booklet "The Place of the Engineer in RCA" interesting reading. Mail the coupon for your free copy.

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ELECTRON TUBES HARRISON, N. J.

Shock Testing

(*Continued from page* 38)

for various natural frequencies of the beam-load system. This information is useful for design purposes, as it indicates the strength required of each structural member whose natural frequency is known.

The maximum acceleration d^2y/dt^2 of the load in Fig. 4, as a function of the natural frequency of the beam-load system, is illustrated in Fig. 10 for the conditions of a one foot free fall of the hammer. The solid curve indicates the maximum acceleration of the load when the support (x in Fig. 4) is attached at the edge of the mounting plate, point *B* in Fig. 9 (A). The dotted curve, on the other hand, indicates the maximum acceleration of the load when the support is mounted at the center of the mounting plate, point (*C*) in Fig. 9 (A).

It is of interest to compare the curves of Fig. 10 with the velocity-time diagrams shown in Figs. 9 (B) and (C). It is evident that these velocity-time diagrams have some of the characteristics of the dotted line of Fig. 7, with several frequencies superposed in some instances. Consequently, the vibration amplitude of the load (y in Fig. 4) tends to build up to a relatively high value, and its maximum acceleration becomes large, when the natural frequency of the beam-load system coincides with a prominent frequency of vibration of the mounting plate. This accounts for the peaks of the curves of Fig. 10. The diagram in Fig. 9 (B) apparently embodies vibration whose frequency is higher than that in Fig. 9 (C); the peak of the solid curve in Fig. 10 therefore occurs at a higher frequency of the beam-load system than that of the dotted curve. The peaks in Fig. 10 are an indication of the predominant frequencies in the velocity-time diagrams of Fig. 9.

Maximum Beam Stress

The maximum stress in the beam of the beam-load system shown in Fig. 4 is directly proportional to the maximum acceleration experienced by the load. From the results shown in Fig. 10, it may be concluded that this maximum stress is a function of both the natural frequency of the beam-load system and the exact location of its attachment to the mounting plate shown in Fig. 9 (A). A chance selection of natural frequency for a structural member may introduce a peak as illustrated in

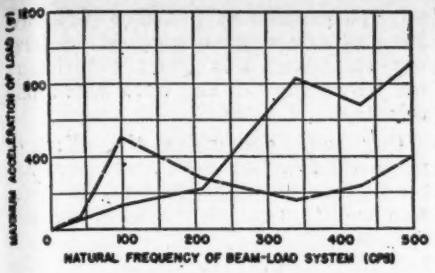


Fig. 10: Max. acceleration of load in Fig. 4 when support is attached to mounting plate of shock testing machine in Fig. 8. Solid line refers to attachment at point B, dotted line to attachment at point C

Fig. 10. A high stress then results, with consequent danger of failure. It is recognized that many failures during service conditions are the result of such a coincidence of frequencies; the type of shock test records shown in Figs. 9 (B) and (C) therefore have merit. The impracticability of exploring all possible service conditions in a laboratory test has suggested the possibility of designing a test to substantially eliminate the resonant build-up illustrated in Fig. 7. This is accomplished by employing a shock motion which is defined by an acceleration-time diagram whose duration is one half cycle. Machines of this type will be described in Part Two.

Figure Credits

Fig. 1. Official U. S. Navy photo. Fig. 2. From "Some Characteristics of Navy High Impact Type Shock Machines", by Irwin Vigness, Proc. SESA, Vol. V, No. 1, Addison-Wesley Press, Inc. Figs. 5, 6, 7. From an unpublished paper by E. G. Fischer, Westinghouse Research Labs. Fig. 8. Raytheon Mfg. Co. photo. Fig. 9. U. S. Navy photo, from "The Equivalent Static Accelerations of Shock Motions", by J. P. Walsh and R. E. Blake, Proc. SESA, Vol. VI, No. II, Addison-Wesley Press, Inc. Fig. 10. From "The Equivalent Static Accelerations of Shock Motions", by J. P. Walsh and R. E. Blake, Proc. SESA, Vol. VI, No. II., Addison-Wesley Press, Inc.

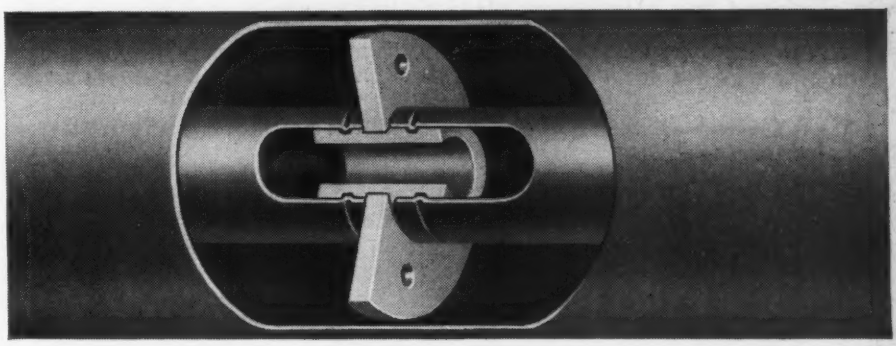
REFERENCES

1. See "Dynamics of Package Cushioning", by R. D. Mindlin, Bell System Technical Journal, Vol. 24, Nos. 3-4, July-October, 1945. Fig. 15 is similar to Figure 3.2.2 of Dr. Mindlin's paper, plotted to a different coordinate scale and extended to higher frequency ratios. The mathematical basis for the curve is equations 3.2.9. and 3.2.13.
2. Fig. 16 is obtained from the same basic equations as Fig. 15. It can be shown that the ratio plotted as the ordinate in Fig. 16 is expressed mathematically by the quotient obtained by dividing equations 3.2.9 and 3.2.13 of Dr. Mindlin's paper by the frequency ratio which is plotted as the abscissa in Figs. 15 and 16.

General Ceramics Licensed to Make Magnetic Ferrites

Philips Laboratories, Inc., has granted to the General Ceramics and Steatite Corporation, Keasbey, N. J., a license under a number of patents pertaining to magnetic ferrites and their manufacture. These magnetic ferrites, as new high efficiency core materials, are used in television and radio receivers and in carrier telephone systems.

Andrew VHF and UHF
"TEFLON" insulated
TV TRANSMISSION LINES



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LETTERS...

Residual Magnetism in Low-Noise Tubes

Editors, TELE-TECH:

We read the article on a low-noise audio pentode* and wondered about the residual dc magnetism in the nickel electrode components. The British found that by "degaussing" tubes to be used in the hi-gain amplifiers, the reaction between the dc flux fields set up in the nickel sections by the spot-welding operations and the ac field of the heater, was eliminated and a lower amplifier hum level produced. We checked some miniatures in a powerful ac demagnetizing solenoid and found them to be quite magnetic. We didn't get a chance to magnetize some sample tubes in a dc magnetizing solenoid in three different axis directions to check the effect on hum level in a hi-gain amplifier. Has anyone made any checks on this in the U. S.?

TED POWELL,
Great Neck, N. Y.

* TELE-TECH, Vol. 10, No. 2, page 31

Editors, TELE-TECH:

In reply to the question concerning the effect on hum level of alternately placing a tube in each of three mutually perpendicular positions with respect to a dc magnetizing field, we have not performed this exact experiment, nor do we know of any work done along this line.

Our work concerning the effect of magnetic fields on tube hum level has been with a magnetic field whose direction was that which gave the greatest reduction in tube noise. In all cases it has been found that the hum attributable to residual magnetism of the tube parts is insignificant in comparison to the tube noises due to other causes. For this reason, the greater part of our effort in producing a tube with a lower overall noise level has been directed to the reduction of the more obvious, higher level, noises.

R. A. WISSOLIK,
D. P. HEACOCK,
Radio Corp. of America,
Harrison, N. J.

Sub-Contractor Wants Orders

Editors, TELE-TECH:

As expressed in your editorial in a recent issue of TELE-TECH, we feel that we "had better get started" on Defense work while we can still get materials and while we HAVE PERSONNEL to run the show. It is always relatively easy to train personnel for a production line, but key personnel of engineering character are hard to find when you need them.

We thought that you might be interested in the enclosed brochure "Electronic Production Problems" about our company and its activities.

As you can see from same, we are ready for any emergency and, to put it bluntly "raring to go."

If you know of anyone who needs a subcontractor, we will be glad to get his name and address and send him a copy of the brochure. Also, we will be glad to go into the matter further with firms interested.

C. R. Maduell, Jr.
Delta Electronics, Inc.
P. O. Box 476
New Orleans, La.

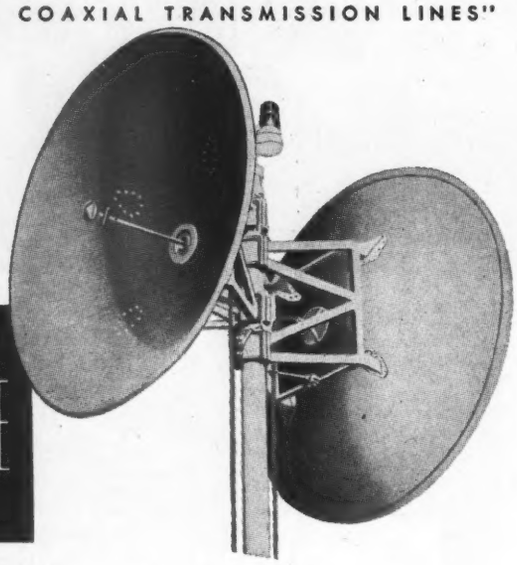
SMPTE to New Offices

Headquarters offices of the Society of Motion Picture and Television Engineers have been moved to enlarged headquarters at 40 West 40th Street, New York City.

RCA Tube Plant Opens in Cincinnati

The new RCA electron tube manufacturing plant in Cincinnati, Ohio, to be devoted exclusively to the production of miniature and subminiature tubes, was dedicated and formally opened recently in ceremonies participated in by top executives of the Radio Corporation of America, the RCA Victor Division, and the National Broadcasting Co. The new one-story plant occupies a tract of 17 acres and contains 136,000 square feet of floor space.

"THE WORLD'S FINEST COAXIAL TRANSMISSION LINES"



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Prodelin Job-Packaged Engineering saves valuable time and reduces installation costs by placing every necessary piece of signal transmission equipment, including tools, at your location and ready for operation—when you need it. Our long line radio relay link experienced engineers are always ready to discuss your signal transmission equipment problems with you. They'll be happy to show you how Prodelin can serve you best.

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ARLINGTON, NEW JERSEY

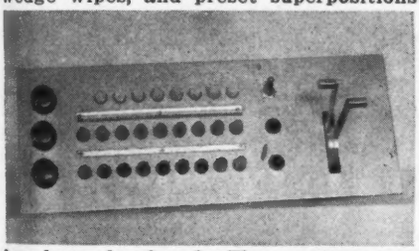
Potentiometer

Type 746 potentiometer incorporates several features not offered in other precision potentiometers. Its all-metal con-

struction permits functional tolerances to be held more closely. The unit is designed to permit the ganging of up to 20 potentiometers on a single shaft and easy removal and replacement within a ganged assembly. General specifications cover both linear and non-linear windings over a range of resistances up to 100,000 ohms, and guaranteed accuracy of .5% linear and 1% non-linear based on over-all resistance. Torque is only 1.5 ounce-inches. Service life is guaranteed to 1,000,000 cycles of operation.—**Fairchild Camera and Instrument Corp., 88-06 Van Wyck Blvd., Jamaica 1, N. Y.**—TELE-TECH

TV Montage Amplifier

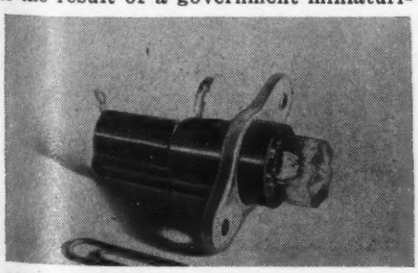
A new television montage amplifier which permits vertical, horizontal and wedge wipes, and preset superpositions



has been developed. The montage amplifier, (TV-35-B) and its control panel, (TC-34-A) allow two-signal self-keyed or three signal keyed insertions of sponsor's products or advertising material. The units are extremely fast acting, allowing sharp, clear keying of irregularly shaped areas. To assure proper positioning and picture composition, a locating signal may be fed to the studio camera viewfinder. Horizontal, vertical and wedge wipe action may be stopped at any point.—**Dept. N-1, General Electric Co., Electronics Park, Syracuse, N. Y.**—TELE-TECH

Fuseholder

A new miniaturized indicating fuseholder that instantly spots blown fuse is the result of a government miniaturi-

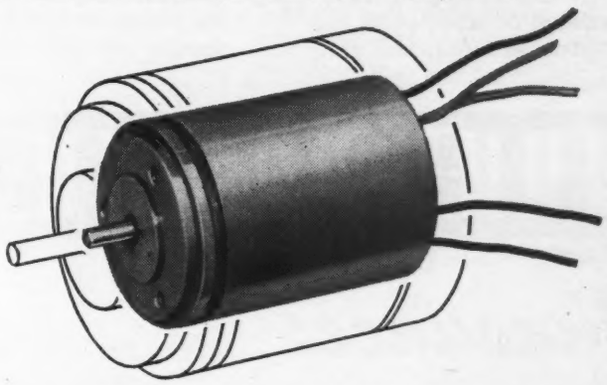


zation contract. The unique design (440-3FH) has a neon bulb and double contacts molded as an integral part of the crystal clear lens. The neon bulb glows when fuse blows. It can be seen from any angle, giving an immediate indication of trouble. It is an ultra-compact unit that takes very little mounting space on or behind the panel (requires mounting centers and clearance behind the panel of only 1⅝ in.).—**Alden Products Co., 117 N. Main St., Brockton 64, Mass.**—TELE-TECH

ECLIPSE-PIONEER

Announces the New Line of

PYGMY SYNCHROS



Size of pygmy as compared to AY-200 series outline

Eclipse-Pioneer has added a tiny new member to its great family of famous Autosyn* synchros. It's the new AY-500 series, a precision-built pygmy weighing only 1¾ oz. while scaling only 1.278″ long and .937″ in diameter (the same diameter, incidentally, as a twenty-five cent piece). Its accuracy and dependability are assured, thanks to Eclipse-Pioneer's 17 years of experience and leadership in the development of high precision synchros for aircraft, marine and industrial applications. For more detailed information on the AY-500 and other E-P Autosyns, such as the remarkably accurate AY-200 series (guaranteed accuracy to within 15 minutes on all production units), please write direct to Eclipse-Pioneer, Teterboro, N. J.

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Typical Performance Characteristics

	One AY-201-3 Driving		One AY-500-3 Driving
	One AY-500-3 Control Transformer	Two AY-500-3 Control Transformers	One AY-500-3 Control Transformer
INPUT			
Voltage	26-volts, single-phase	26-volts, single-phase	26-volts, single-phase
Frequency	400 cycles	400 cycles	400 cycles
Current	88 milliamperes	110 milliamperes	55 milliamperes
Power	0.8 watts	1.2 watts	0.9 watts
Impedance	105+j280 ohms	100+j220 ohms	290+j370 ohms
OUTPUT			
Voltage Max. (rotor output)	17.9 volts	16.2 volts	14.1 volts
Voltage at null	40 millivolts	40 millivolts	40 millivolts
Sensitivity	310 millivolts/degree	280 millivolts/degree	245 millivolts/degree
Voltage phase shift	23 degrees	26 degrees	44 degrees
System accuracy (max. possible spread)	0.6 degrees	0.6 degrees	0.75 degrees

Other E-P precision components for servo mechanism and computing equipment:

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EMPIRE STATE TV TOWER GOES INTO ACTION

ON Monday, June 11, 1951, the world's highest artificially supported television antenna was put into service and WNBT on channel 4 in New York City commenced operating from the top of the 215 foot extension to the obsolete mooring mast on the top of the world's highest building. Elevation of TV antennas to the height of 1465 feet above ground is expected to improve service in most areas, and early reports, received as this issue went to press, tended to confirm the engineers' expectations.

Following in rapid order as soon as weather conditions permit will be WJZ-TV, then WPIX, WABD, and WCBS-TV. It is expected that WATV, Newark, N. J. will also move to the tower as soon as the Federal Communications Commission grants the station a construction permit to change the transmitter location.

The sixth station will use a different type of antenna from that employed by the earlier tenants since the tower was not designed to carry more than five antennas of the type now in use. The WATV antenna system will consist of dipoles arranged around the base of the tower in somewhat the same manner that the CBS-TV antennas on the Chrysler Building are now installed. In this manner additional loading will not be put on the new tower. All the new antenna systems and transmission lines now installed are capable of handling the maximum power (200 KW) envisaged by the latest proposed FCC Rules and Regulations.

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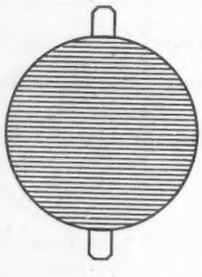

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Tunable X-Band Magnetron Development

In Part I of the article entitled "Low-Voltage Tunable X-Band Magnetron Development" appearing in the June issue of TELE-TECH (pages 50, 51, 84), the subtitle erroneously listed the magnetron type number as PAX 5. Correct designation is PAX 3. Also, on page 50, column 1, line 8 "stability of ± 8 MC" should read "stability of ± 3 MC" and on page 51, equation 4 should read:

$$I_o = \frac{5.23 \times 10^5}{(1 - s^2)^2 \left(\frac{1}{s} + 1\right)} \; a_1 \left(\frac{D_a}{n}\right)^3 \frac{h}{a}$$

MINIATURE TAPE RECORDER

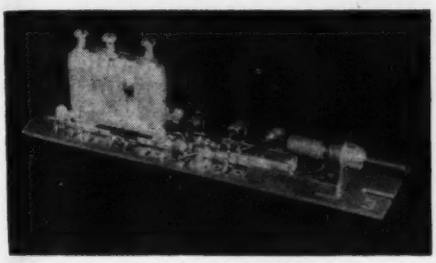
W. V. Stancil (left) and H. B. Hoffman with M5A "Minitape" magnetic recorder now being made by Stancil-Hoffman Corp., Hollywood, Calif. A professional type portable unit, it has a frequency response of 100-5000 cps tape speeds of 3.75, 7.5 or 15 in./sec., battery operated, measures 14 x 6½ x 6¼ in. and weighs under 15 lbs. Mike may be crystal or dynamic.

UHF-TV AT BRIDGEPORT

(*Continued from page* 32)

The Philco receiver used a purely experimental type of "matchbox" converter which was attached to the rear of the set. Two tubes and a crystal are used in this and it becomes an integral part of the set by virtue of its permanent connections for heater and "B" supplies. Since this was not offered as a solution, but merely as a *method* it it would not be reasonable to disclose technical details.

A G.E. converter was also demonstrated and switched on from cold it appeared to drift very little during the first few minutes of operation. It was possible to try almost any combination of antennas on the receivers and at this distance from the transmitter—about five miles—all appeared almost equally effective. No ghosts were observed on any of the screens. This indicates attention to



The Zenith UHF-TV tuner strip which can be inserted in every Zenith TV tuner made

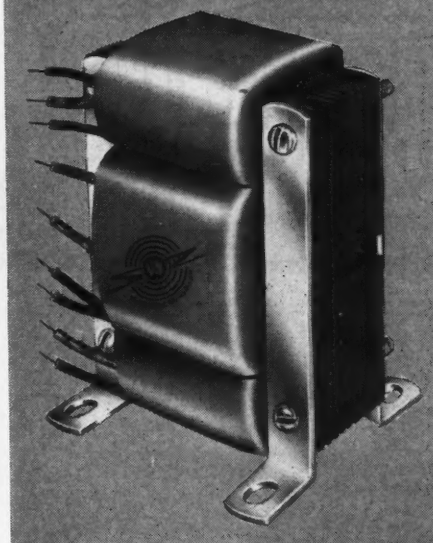
impedance matches in the converter connections and tuning strips and a good antenna location. Naturally one would expect this from a demonstration installation. Again, no figures as to relative field strengths were available, but it was obvious that the local UHF signal was many db above the VHF one from New York.

Conversion Simple

All the observers were much impressed with the ease of conversion of the Zenith receiver tuner and the palpably easy conversion of receivers employing Standard Coil Tuners. In fact the author has revised his views on the usefulness of UHF-TV and feels that perhaps it is not as far off as at first appeared. Of course, we have yet to see strips and converters operating in the high end of the band—around 890 MC. Both Standard and Zenith claim tuner strips at this frequency will not present undue difficulty. It would seem that an opportunity exists for another public spirited transmitter manufacturer to erect an 890 MC TV transmitter in much the same selfless way that RCA did at Bridgeport. Although all the tests to date appear to prove the feasibility of UHF-TV much more information is required concerning the relative field strengths of the stations. This is a point which is glossed over in every conversation heard in connection with the tests. Until VHF and UHF pictures with the same signal strength are shown side by side the tests won't mean much.

In conclusion it might be said that UHF-TV does not appear nearly as remote and improbable as it did a year ago. Although UHF-TV has been likened to the move upstairs of FM—which is generally considered to be the cause of FM's demise—it is felt that this is something which *has* to come since we cannot get any more TV channels in the VHF band. It will be two years at least before any commercial activity is seen in UHF-TV, but the way to initiate it, at least at the low end, has already been demonstrated by the fabrication of UHF tuning strips for turret type tuners. While the external type converters appear to function reasonably well, the impression is very strong that they will not receive public acceptance any more than FM and short-wave converters did.

CIVILIAN OR MILITARY



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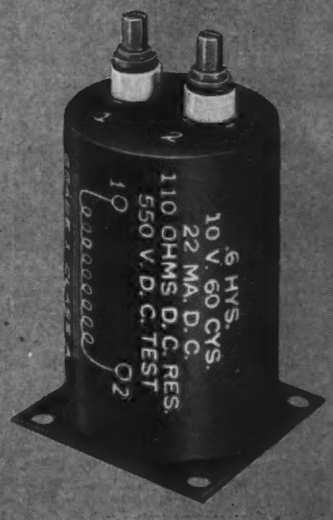
For speed control of color disk for T-V color.



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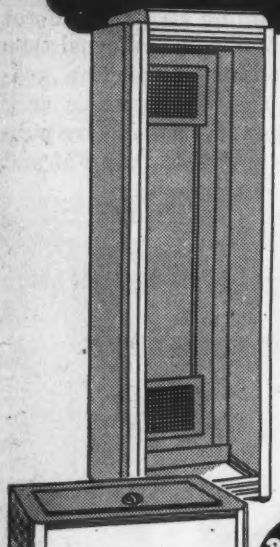

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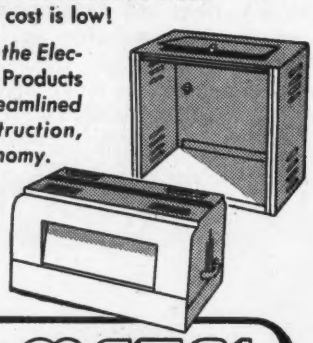

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Color TV

(*Continued from page* 29)

question of devising a compatible color TV system which would make use of the many existing developments accomplished by the participating companies. Demonstrations were held at the following laboratories during the life of the committee: Hazeltine Electronics Corp., Radio Corporation of America, Allen B. DuMont Laboratories Inc., Philco Corp., General Electric Company.

As a result the *ad hoc* committee recommends that revised standards be set up to provide color TV service. The principles of color TV transmis-

New Air King color television receiver uses a 10-in picture tube. Magnifier expands picture to 12½-in. size. Number of controls appearing on front of cabinet may ultimately be reduced to two

sion suggested follow closely those already in use for monochrome TV with the exception that chromatic information is conveyed by a subcarrier transmitted within the normal signal. To detect the subcarrier a reference signal is added to the sync signal.

Committee Members

Members of the *ad hoc* committee are:

David B. Smith, Chairman
Philco Corp.

Robert M. Bowie*
Sylvania Electric Products, Inc.

Elmer W. Engstrom
Radio Corporation of America

Thomas T. Goldsmith, Jr.
Allen B. DuMont Laboratories, Inc.

Ira J. Kaar
General Electric Co.

Arthur V. Loughren
Hazeltine Electronics Corp.

In addition, Axel G. Jensen of the Bell Telephone Laboratories has

* Joined the Committee during January 1951

served as a consultant to the Committee.

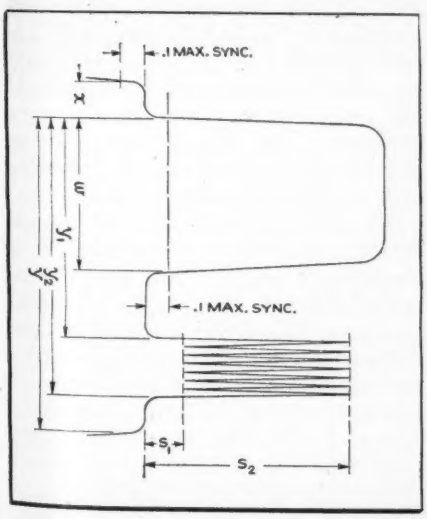
The Committee has witnessed demonstrations and heard discussions of various developments and improvements in the color television on the dates indicated:

DATE	PLACE
21 November 1950	Hazeltine Electronics Corporation at Little Neck, Long Island
11 January 1951	Radio Corporation of America at Trans-Lux Building, Washington, DC
29 January 1951	Allen B. DuMont Laboratories, Inc. at Passaic, New Jersey
8 February 1951	Philco Corporation at Philadelphia, Pa.
23 February 1951	General Electric Company at Electronics Park, Syracuse, New York
27 February 1951	Hazeltine Electronics Corporation at Little Neck, Long Island

Proposed Standards

(1.0) The present Federal Communications Commission transmission standards for black-and-white television shall continue to be used for the transmission of compatible color television.

(2.0) Chromatic information shall be transmitted by means of a color subcarrier modulated in amplitude and phase with respect to a reference subcarrier of the same frequency. The color subcarrier shall



Suggested color synchronizing waveform for NTSC.-RCA-Industry Color TV System

be transmitted simultaneously with the video signal and during only the video portion of the composite signal. Synchronizing signals to transmit information concerning the reference subcarrier shall be transmitted only during the synchronizing and blanking intervals of the composite video signal.

(*Continued on page* 78)

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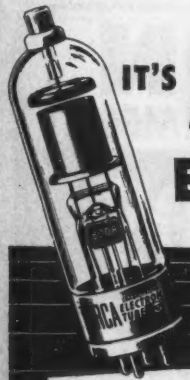

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Directional TV Antenna

(*Continued from page 27*)

system were carefully checked for high voltage breakdown, dc resistance, and standing wave ratio during its installation. The standing wave ratio was determined over the entire TV channel by means of a high frequency sweep oscillator, a diodetector and cathode ray oscilloscope, a marker oscillator and a long length of coaxial cable with a termination as a standard. This method is fast, accurate, simple and a great labor saver compared to the slotted line measurement technique. Adjustments can be made with the test equipment in operation, thereby giving an immediate indication of the voltage standing wave ratio. This is very convenient when the installation is complete and small adjustments are desired, such as a small variation in the length of a stub, the optimum position of a shortening bar or a change in a connector strap. Since the VSWR should be as near as to unity as possible, every effort is made to make the antenna's impedance resistive over the entire useful spectrum.

Testing Antenna Performance

Routine tests of the antenna performance were made by means of the RCA WM21A sweep generator which provides a 0 to 10 MC sweep signal to the modulator of the visual transmitter. The rectified sweep response of the entire system can thus be compared with the sweep response when the visual transmitter is operating into a resistance dummy load.

The outputs of the visual and aural transmitters are combined in a "notch type" diplexer to feed the antenna through the single transmission line. The diplexer was suspended from the ceiling and wall by flexible rods in such a manner that the input and output connections can be easily opened for routine tests with a sweep generator and dummy load resistor. The ungassed coaxial line tapers and couplings were all split with a hack saw to permit easier assembly and inspection.

This antenna system with the power equalizer and notch diplexer does not afford as much band width as the Super Turnstile with the bridge diplexer. However, this difference is not apparent on most home receivers which are generally incapable of accepting side band information of 4.5 MC or more.

1. R. W. Masters, "A Power Equalizing Network for Antennas" Proceedings of the IRE, Vol. 37, No. 7, July, 1949.

PERSONNEL

Jay E. Browder has been appointed chief of the radio communications engineering section of Kollsman Instrument Corporation, Elmhurst, N. Y.

Earl E. Bradway has been named General Manager of DeJur-Amsco Corporation, Long Island City, N. Y., manufacturers of industrial meters, precision potentiometers and rheostats. He has spent several years as a consulting engineer and recently resigned as president of the Colgate Manufacturing Corp. to accept his present position.

Joseph B. Hersh has been appointed executive vice-president and general manager of the Utility Electronics Corporation, of Newark, N. J. Hersh, formerly chief engineer with the David Bogen Co., Inc., holds four inventors' patents, his outstanding accomplishment being the development of the electronic oscillometer.

James G. Flynn, Jr., has been named manager of the new Dallas, Tex. broadcast and communications equipment plant built by Collins Radio Co., Cedar Rapids, Iowa. He was formerly director of operations of American Airlines' Eastern Division.

Fred Whitney has joined the staff of the Society of Motion Picture and Television Engineers to take charge of test film technical operations.

Dr. Henry G. Booker, professor of engineering at Cornell Univ., has been elected to the board of directors of the LaPointe-Plascomold Corp.

William P. Ready has been appointed general sales manager of the National Company, Inc., of Malden and Melrose, Mass. Mr. Ready has served with the company since 1946, his most recent previous position being television sales manager. He is a veteran of World War II, having served as a captain in the Pacific with the United States Army Signal Corps, and is an alumnus of Massachusetts Institute of Technology, class of 1940.

Harry B. Lubcke, fomerly associated with KSTL, Hollywood, Calif., has opened his own consulting engineering firm. Offices are in Hollywood.

Harold W. Giesecke has recently been appointed assistant to the general manager of Bendix Radio. He was previously with Westinghouse Radio in charge of New Products.

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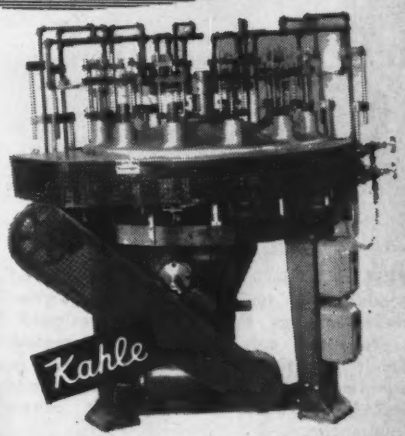
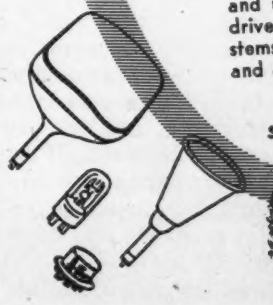


Production-boosting, labor-saving equipment for complete manufacture of cathode ray tubes, standard, miniature and sub-miniature radio tubes, sub-miniature tubes, fluorescent lamps, photocells, x-ray tubes, glass products.



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Color TV

(Continued from page 75)

(2.1) To ensure practical invisibility of the color subcarrier its normal frequency, but not phase, shall be related to the horizontal scanning frequency in the following manner: The color subcarrier frequency shall be an odd multiple of half the horizontal scanning frequency.

(2.2) For standard operating conditions, the amplitude of the primary video signal and the amplitude and phase of the color subcarrier shall be specified in terms of a "proper" set of taking characteristics.

(Definition: A "proper" set of taking characteristics is defined as a set, each one of which is a linear combination of ICI distribution characteristics.)

(3.0) The color sync signal shall be transmitted by means of a burst of the reference carrier superimposed on the back porch following each horizontal sync pulse in accordance with the detail shown in the illustration.

Objectives and Operation of the Joint Technical Advisory Committee

THERE appears to be considerable misinformation and lack of understanding among many engineers concerning the purpose and operation of JTAC.

The Joint Technical Advisory Committee was brought into being for the purpose of rendering additional public service with and for the Institute of Radio Engineers and the Radio and Television Manufacturers Association. Objectives of JTAC are to obtain and evaluate information of a technical and engineering nature and advise government engineering groups and any other professional or industrial groups on matters pertaining to the radio arts. In order to obtain an objective point of view the committee was organized to consist of eight members with no alternates. Each member serves for a term of two years commencing July 1st and terminating June 30th. In order to maintain continuity of action, half the initial roster of members was appointed to serve two consecutive terms. The members are drawn from the ranks of qualified engineers irrespective of employment, and half are nominated by the IRE and half by the RTMA. Both groups have to confirm appointments. No members receive any regular compensation from the government.

The expenses of the committee are

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REEVES Soundcraft Laboratories afford you the best in television picture tubes at prices consistent with such quality. When precision requirements dictate the need for high efficiency and fidelity, Reeves products are the answer. Constant improvement, through greater engineering know-how stands behind our guarantee of complete satisfaction.

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borne equally by the IRE and the RTMA and in order to assist the objectivity of the committee generally, the business affiliations of the members are omitted from committee records. Whenever there are any existing committees, either IRE or RTMA, JTAC makes use of these committees as far as possible. However, when such a qualified group does not exist, then JTAC may appoint *ad hoc* committees to study a particular subject. Of course, the committee also makes use of qualified engineers and sources of expert information outside the IRE and the RTMA.

Listed in the charter of the Joint Technical Advisory Committee are seven duties which are: (1) to consult with responsible government and other professional bodies to determine technical information required to ensure the best use of radio facilities; (2) to handle the problems selected by it in the best order of priority, having regard for the needs of the profession and the public; (3) to determine the outlines of information required and to submit questions to qualified persons who can provide the information required; (4) to sift the information obtained from qualified groups so as to resolve conflicting information and establish matters of fact; (5) to present the findings in a clear manner and understandable manner to the group requesting the original information; (6) to make the findings available to the profession and the public; (7) and to appear if necessary before government or other parties to interpret the findings of the committee in respect to other information presented.

New Rep for Polarad

Polarad Electronics Corp., 100 Metropolitan Avenue, Brooklyn 11, N. Y., has announced the appointment of Harold A. Kittleson as its engineering representative on the West Coast, covering the states of California, Arizona and New Mexico.

Improved 16 mm Sprocket Intermittent Developed by GPL

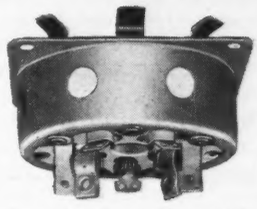
General Precision Laboratories, Inc., Pleasantville, N. Y., has recently announced that high quality, precision, 35 mm type sprocket intermittents are now being used on 16 mm projectors. They will be standard equipment on GPL's PA-100 television sync projector, and on the PB-100 portable utility projector. The new sprocket intermittents, providing greater screen brightness, reduces film wear, and simplified framing, are said to put 16 mm quality on a par with that of 35 mm.

MORE THAN A TUBE SOCKET...

JOHNSON 122-101

A Basic Sub-Assembly

FOR VHF



Provision for mounting button mica capacitors directly to socket. Special contacts permit mounting grid coils directly on terminals. Ventilated aluminum base shield recesses socket below chassis for short lead length. Two holes provided for mounting buss bar neutralizing leads.

Here's one of the most popular transmitting tube sockets for VHF in America today — the JOHNSON 122-101.

It's especially designed for VHF and UHF use with Septar based tubes, such as the 826, 829, 832 and 4D32.

The 122-101 is a 7-pin steatite wafer socket incorporating ventilated base shield. Five tube retainer springs grip the tube securely even under severe conditions encountered in mobile operation.

Steatite insulation, silver-plated contacts that are recessed to prevent movement, and the ventilated base shield permit Septar based tubes to be operated at full input with maximum efficiency at their high frequency limits. Mounting holes are .185" on 2-5/16" square.

For further information, consult E. F. JOHNSON COMPANY, the leading producer of power tube sockets in the electronics industry.

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BOOKS

Pulse Techniques

By Sidney Moskowitz and Joseph Racker, Federal Telecommunication Labs., Inc. Published 1951 by Prentice-Hall Inc., 70 Fifth Avenue, New York City, 300 pages. Price $6.65.

The vast improvements in recent years in the fields of television, radar, microwave radio links, and in the development of special electronic devices have caused a renewed interest in the art of using pulses for many applications. This up-to-date presentation on the subject is therefore a valuable addition to any engineer's library.

Use of the term "Pulse Techniques" is made to differentiate them from "standard" techniques. The major difference between the two is that pulses cannot readily be described in terms of frequency functions, and hence circuits cannot be expressed by conventional impedance notation. For example, the term $j\omega L$ has little meaning when pulse voltages are applied across the inductance since there is no easy method for determining ω. The transient response of linear networks rather than the frequency or phase response is therefore of primary design interest. The authors, starting with familiar conventional theory, gradually ease the reader through several transitional setups into this new concept of circuit analysis.

Since the primary objective of this text is to enable interested engineers to analyze and design circuits for transmission and utilization of pulses, mathematical material is limited to that which will enable the reader to apply these methods intelligently to many practical problems. Starting with simple RC filters, the pulse response of linear networks is developed leading to relatively complex pulse amplifiers. Descriptions and design principles involved in many non-linear networks frequently used are given. Finally, methods of pulse measurement and the design of communication and aerial navigation equipment using pulses are reviewed.—B.F.O.

Understanding Vectors & Phase

By John F. Rider and Seymour D. Uslan. Published by John F. Rider Publisher Inc., 404 Fourth Avenue, New York 16, N. Y. 153 pages. First published, 1947. Price $1.89.

This is an excellent book for any engineer who has allowed his vectors to grow rusty through lack of use! Although starting out at the lowest mathematical level the book is capable of being picked up at any place and provides adequate reference to enable the absent minded reader to refresh his supply of facts very easily. It is a small book, but full of important information, which makes it suitable for carrying around. The re-issue of this book should prove to be popular with many engineers.—J.H.B.

Radio & Television Receiver Circuitry & Operation

By Alfred A. Ghirardi and J. Richard Johnson. Published 1951 by Rinehart Books Inc., 232 Madison Ave., New York 16, N. Y. 669 Pages. Price $6.00.

This well-written, practical text discusses the circuits and principles of operation involved in the fields of AM and FM radio, television, and audio recording and reproduction. The first two in the sixteen chapter presentation describe amplitude and frequency modulated transmission systems, while the next four chapters contain a detailed analysis of the different types of TRF and superheterodyne circuits employed in AM and FM receivers. Two chapters are devoted to audio amplifiers and loudspeakers with home recorders, phono pickups and record players, and automatic record changers comprising three more. More than 100 pages of the text are devoted to television, where in addition to a stage by stage operation analysis of modern TV receivers, a discussion of the different color TV systems is also presented. Other chapters cover: push button tuning and AFC systems, radio receiver power supply systems, receiving antenna systems and mechanical construction of receivers.—B.F.O.

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Communication Networks & Lines

By Walter J. Creamer, Professor of Communication Engineering, University of Maine. Published 1951 by Harper & Brothers, 49 East 33rd St., New York 16, N. Y. 353 Pages, price $6.00.

As a basic text, this book is a comprehensive and unusually thorough mathematical treatment of the subject of communication networks and lines. Part I covers network analysis and problems in the design of attenuators, filters and equalizers as well as some elementary problems in network synthesis. Part II presents the theory of communication lines with extensive applications to cables and open-wire circuits at audio and carrier frequencies. The final chapter provides the essential theory of high-frequency lossless lines, with examples of impedance transformations and matching stubs. The processes employed are largely algebraic. Eight appendices provide all necessary supplementary data in the form of formulas, charts, tables of hyperbolic functions and characteristics of transmission lines.—B.F.O.

BOOKS RECEIVED

Notebook UHF Television and UHF-VHF Tuners

By Edward M. Noll. Published 1951 by Paul H. Wendel Publishing Co., Inc. (P.O. Box 1321) Indianapolis, Ind. A readily understandable notebook on UHF television characteristics and UHF-VHF tuners designed by such leading manufacturers as Standard Coil, Sarkes Tarzian, General Instrument, Stromberg-Carlson, Hallicrafters, Philco, Zenith, DuMont, and RCA. Illustrations include circuit schematics, block diagrams and waveforms. Price $1.00.

Fundamentals of Electrical Engineering

By F. H. Pumphrey. Published by Prentice Hall Inc., 70 Fifth Ave., New York 11, N. Y. Price $7.65. Professor Pumphrey's work is primarily designed for students specializing in other fields of engineering so that they can gain the invaluable basis of a knowledge of the electrical field. It is also intended as a text for first year electrical engineers and as a reference "during the early professional life of the student." It emphasizes the intelligent selection and operation of electrical equipment.

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Nerve center of Rockefeller Center's civilian defense organization is this control board located on the second floor of the 70-story RCA Building. As the man at the left receives calls from the building wardens in each of the Center's structures, specialized first aid and fire fighting squads are relayed over the Motorola Uni-Channel Sensicon Dispatcher at the right

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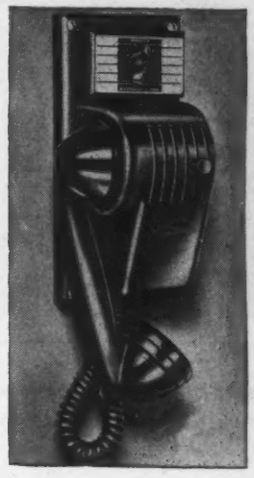

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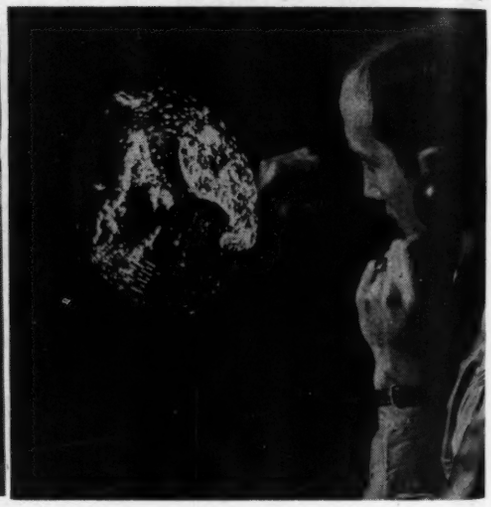
Shore Radar for New York Harbor

THE Port of New York Authority has commenced an experiment in the use of shore-based radar at Fort Wadsworth, Staten Island, to test the feasibility of the use of radar in transmitting information to ships on their positions in relation to channel markers and other craft during periods of poor visibility.

The experimental Harbor Radar Information Center, which will remain in operation through November 1951, was authorized by the Port Authority commissioners on February 9, 1951. The experiment is being conducted with equipment furnished by the Sperry Gyroscope Company, Inc., of Great Neck, Long Island, and the Raytheon Manufacturing Company of Waltham, Massachusetts. The radar site was made available by the United States Army and the Port Authority staff is directing the project and providing the operating staff.

The experiment was inaugurated by a demonstration of the tracking of the Sperry Gyroscope Company's ship "Wanderer" as a target vessel, with members of the press and the Harbor Radar Advisory Committee

Raytheon (left) and Sperry (right) Radar installations, Staten Island, N. Y., guide vessels through harbor in poor visibility.



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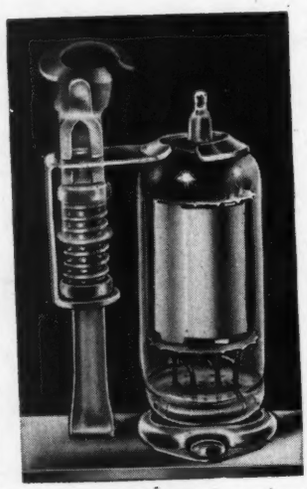
New **BIRTCHER TUBE CLAMP FOR MINIATURE TUBES**

POSITIVE PROTECTION AGAINST LATERAL AND VERTICAL SHOCK!



The *New* Birtcher Type 2 Tube Clamp holds miniature tubes in their sockets under the most demanding conditions of vibration, impact and climate. Made of stainless steel and weighing less than ½ ounce, this New clamp for miniature tubes is easy to apply, sure in effect. The base is keyed to the chassis by a single machine screw or rivet . . . saving time in assembly and preventing rotation. There are no separate parts to drop or lose during assembly or during use. Birtcher Tube Clamp Type 2 is all one piece and requires no welding, brazing or soldering at any point.

If you use miniature tubes, protect them against lateral and vertical shock with the Birtcher Tube Clamp (Type 2). Write for sample and literature!

Builder of millions of stainless steel locking Type Tube Clamps for hundreds of electronic manufacturers.

The **BIRTCHER** *Corporation*
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as observers. Admiral Edmond J. Moran, president of the Moran Towing and Transportation Company, Inc., is chairman of the committee, which includes representatives of the shipping lines, towing companies, harbor pilots and Federal Government agencies.

In its initial stages, the test program will make use of tug boats made available by the Moran Towing and Transportation Company, and the Sperry Gyroscope Company's experimental ship "Wanderer" as target vessels to test the working of the equipment and the tracking and coaching procedures. After proper operating methods have been established, it is planned to give position information to pilots aboard ships entering the harbor in fair weather so that the data provided by the radar equipment can be checked visually. Information to ships during periods of fog will come during the project's final stages.

Shore-based radar is now in use in the harbors of Liverpool, England, and Long Beach, California, and is being operated experimentally in the harbors at San Francisco and Baltimore. Additional installations are under construction in Le Havre, France, and Southampton, England.

Production Aids

(*Continued from page* 43)

aprons or end plates are punched, formed, and plated. 20% of the working area is devoted to subassembly manufacturing operations while the remaining 65% provides for a main assembly line and alignment and test positions.

The distribution of the available working area has introduced some unusual material handling problems in this plant. To help overcome this situation, the main assembly line was designed to handle receiver chassis only. An overhead conveyor brings these chassis from the subbase area on the floor above directly to the start point of main assembly line on the floor below. Smaller and lighter subassemblies are elevated down in bins or in rolling racks.

By having the chassis aprons mount separately, it becomes possible to construct relatively large subassemblies, and these by being as complete as possible circuitwise, minimize the number of connections required to the main chassis. The installation of the chassis in its cabinet and the subsequent packing of the receiver into corrugated cartons is treated separately as a subassembly type of operation on the lower floor.

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Must have at least one year's experience. For work on airborne radar, shipborne radar, radio communications equipment: micro-wave relay or micro-wave communications.

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BULLETINS

Transformers

The Halldorson Co., 4500 Ravenswood Avenue, Chicago 40, has recently brought out a new catalog #19 which lists a complete line of radio and television transformers.

TV Transmitting Equipment

Several new equipment bulletins are available from the television transmitter division of Allen B. Du Mont Laboratories, Inc., Clifton, N. J. Among these new bulletins are: the Universal Color Scanner, Master Control Switch Unit and Master Control Mixer Amplifier, Universal Console and Linearity Bar Generator.

Instrument Transformer Buyer's Guide

A profusely illustrated, 93-page brochure (GEA-4626) supplying pertinent buying information on G-E instrument transformers, has been announced as available by the General Electric Company's Meter and Instrument Division, Schenectady 5, N. Y.

Plastic Molding Facilities

General Information on the plastic molding facilities of P. R. Mallory Plastics Inc., 3670 Milwaukee Ave., Chicago 41, Ill., is contained in a new bulletin issued by the company.

Data on Springs

A "Handbook of Technical Data on Springs" has been published by the Accurate Spring Manufacturing Co., 3811 West Lake St., Chicago 24, Ill. Description of spring design, load deflection tables, conversion formulae, and other useful tables are included.

Selenium Rectifiers

Seletron Division of Radio Receptor Co., Inc., has prepared a comprehensive new 16-page catalog on its Seletron Selenium Rectifiers. In two colors and fully illustrated, the catalog includes listings of dimensions and ratings for all miniature selenium rectifiers, as well as a large selected group of power stacks. A copy may be obtained upon request to Seletron Division sales department, Radio Receptor Co., Inc., 251 West 19th Street, New York 11, New York.

Reference Book

The 1951 edition of the RCA Reference Book, has been completed by the RCA Tube Dept. at Harrison, N. J., and is being shipped to RCA Tube and Parts Distributors, for issue to engineers, technicians, and purchasing agents. The popular reference book, in addition to being a finger-tip source of essential electronic information, is also a diary, calendar memo, address book, and world atlas.

Resistors

Comprehensive data on characteristics and specifications of advanced type BT fixed composition resistors, for ⅛, ½, 1 and 2 watts are contained in a bulletin (B-1) issued by the International Resistance Co., 401 North Broad St., Philadelphia 8, Pa.

Capacitors and Printed Circuits

Eleven new technical bulletins covering three product classifications have been released to the trade by the Centralab Division of Globe-Union, Inc., 900 E. Keefe Avenue, Milwaukee 1, Wis. They are as follows: Ceramic Capacitors: transmitting capacitors (high voltage type) bulletin No. 42-102; stand-off capacitors, tubular type, bulletin No. 42-

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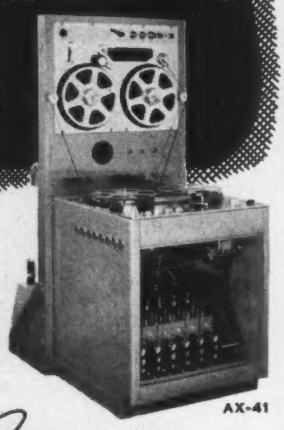

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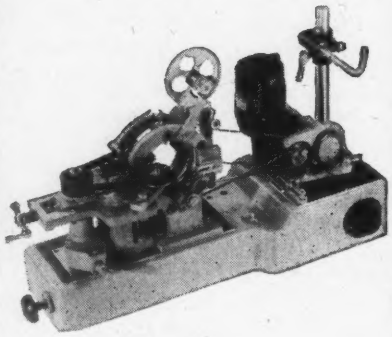

Wide-range, laboratory-type machines available for winding samples and small production runs of toroid coils. Production machines built to meet specific requirements.

Mico Instrument Co.

75 Trowbridge St., Cambridge, Mass.

121; solder-sealed button capacitors, bulletin No. 42-122. Printed Electronic Circuits: Model 2 Ampec, three-stage P.E.C. Amplifier, PC-200, PC-201, bulletin No. 42-117; P.E.C. TV vertical integrator networks, PC-100 and PC-101, bulletin No. 42-126; P.E.C. triode couplates, PC-70 and PC-71, PC-80 and PC-81, bulletin No. 42-127; P.E.C. pentode couplates, PC-90 and PC-91, bulletin No. 42-128; Audet P.E.C. PC-150 and PC-151, bulletin No. 42-129; Model 3 Ampec, three-stage P.E.C. amplifier, PC-202, PC-204, bulletin No. 42-130. Switches: Centralab Lever Action Switch, 1452 Series, bulletin No. 42-141.

Production Facilities

The plant and production facilities of Sarkes Tarzian, Inc., Bloomington, Ind., are fully described in a new booklet recently made available. Short biographies of key personnel, historical sketch of the facilities of Sarkes Tarzian and complete outline of plant equipment potential are included.

Wire Round Resistors

Complete information and specifications on the Wirt line of standard wire wound resistors and accessories is contained in Bulletin No. 176. It is available upon request to Wirt Co., Box 646, 5221-27 Greene St., Germantown, Philadelphia 44, Pa.

Potentiometers

Helipot Corporation, So. Pasadena, Cal., makers of precision potentiometers and other electronic items, has compiled a quick reference technical data chart that provides all pertinent data on the various types of Helipot potentiometers.

Assembly Suggestions

To help industry in meeting urgent defense production needs, Shakeproof Inc., a division of Illinois Tool Works, Chicago, offers a new 24-page booklet entitled "Assembly Suggestions." Specially prepared to assist designers and product engineers in the selection of fastenings best suited for specific requirements, the booklet contains details and illustrations of the newest fastening developments. Copies are available on request addressed to Shakeproof Inc., 2501 North Keeler Avenue, Chicago 39, Illinois.

Saftler Represents General Industries

Perry Saftler, 53 Park Place, New York 57, N. Y., has become eastern representative on sales to both manufacturers and distributors on the line of motors and recording assemblies of the General Industries Co., Elyria, Ohio. Mr. Saftler's organization, in addition to himself, consists of Norman Leeb, George Marron, and Arthur W. Saftler.

Krampf Executive V. P. for Aerovox Corp.

W. Myron Owen, president of Aerovox Corp., has announced the election of Charles E. Krampf to the office of executive vice-president. Mr. Krampf succeeds Bert Conway of Detroit, who will remain with the corporation on a consulting basis and as a member of the Board of Directors.

Mr. Krampf will continue as President of Electrical Reactance Corp., ceramic division of Aerovox Corp. This division has plants located at Olean, and Franklinville, N. Y.; Myrtle Beach, S. C.; and Jessup, Pa. In his new capacity Aerovox Corporation plants at New Bedford, Mass., and Hamilton, Ont., as well as Electrical Reactance Corp., will come under Mr. Krampf's supervision.